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A MODERN ZOROASTRIAN.

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A MODERN ZOROASTRIAN

BY

S. LAING,

AUTHOR OF

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PREFACE TO NEW EDITION.

From some of the criticisms on the First Edition of this work I fear that the distinction I endeavoured to draw between the use of the term "polarity" in the inorganic and in the spiritual worlds has not been made sufficiently clear. I stated in the Introduction "That while the principle of polarity pervades both worlds, I am far from assuming that the laws under which it acts are identical; and that virtue and vice, pain and pleasure, are products of the same mathematical laws as regulate the attractions and repulsions of molecules and atoms." But this warning has been apparently overlooked by some readers who have assumed that instead of analogy I meant identity, and that it was a mistake to use the same word "polarity" for phenomena so essentially distinct as those of the material and the spiritual worlds.

Thus my "guide, philosopher, and friend," Professor Huxley, for whose authority I have the highest respect, observed in a recent article, that he had long ago acquired a habit, if he came across the word polarity applied to anything but magnetism and electricity,

..g may be the accumulation of mis
pole of Society, in contrast with
wealth at the positive pole, this sta
abide and grow continuously worse
(the dual Goddess of the Babylonia
unchecked."

Surely, I thought, here is a ca
Professor must have thrown down t
he came to these words: but wher
end, I found that it was not the
pen, which must have been throwr
article is signed "T. Huxley." Can
conclusive proof that there are a vast va
side of magnetism and electricity, conne
lying idea, which inevitably suggests
and which can be most conveniently
word "polarity"? Words after all are o
tate the interchange of ideas, and the
which serves the purpose most clearl
Thus instead of using a waggon loa
the verbiage of

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Polarity is such a word. It sums up what Emerson says in his Essay on Compensation: "Polarity, or action and reaction, we meet in every part of Nature; in darkness and light; in the ebb and flow of waters; in male and female; in the inspiration and expiration of plants and animals; in the undulations of fluids and of sound; in the centripetal and centrifugal gravity; in electricity, galvanism, and chemical affinity. Superinduce Magnetism at one end of a needle, the opposite Magnetism takes place at the other end. If the South attracts, the North repels. An inevitable dualism besets nature, so that each thing is a half, and suggests another to make it whole: as spirit, matter; man, woman; odd, even; subjective, objective; in, out; upper, under; motion, rest; yea, nay."

These, by whatever name we like to call them, are facts and not fancies, and facts which enter largely into all questions, whether of science, philosophy, religion, or practical policy. Every one who wishes to keep at all abreast with modern culture, ought to have some general knowledge of the ideas and principles which underlie them and which are embraced in the comprehensive word "polarity." My object in this book has been to assist the reader, who is not a specialist, in arriving at some general understanding of the subjects treated of, and I may hope, in awakening such an interest in them as may induce him to prosecute further researches. If I succeed in this, my object will have been attained.

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PREFACE.

The reception given to my former work, on 'Modern Science and Modern Thought,' has induced me to write this further one. I refer not so much to the reviews of professional critics, though as a rule nothing could be more courteous and candid, but rather to the letters I have received from readers of various age, sex, and condition, saying that I had assisted them in understanding much interesting matter which had previously been a sealed book to them.

If I am good for anything, it is for a certain faculty of lucid condensation, and I have thought that I might apply this to some of the less-known branches of modern science, such as the new chemistry and physiology, as well as, in my first work, to the more familiar subjects of astronomy and geology; while at the same time I might extend it to some of the more obvious problems of religion, morals, metaphysics, and practical life, which force themselves, more and more every day, on the attention of intelligent thinkers.

As in the former work the scientific speculations were linked together by the leading idea of the universality of law, so, in this, unity is given to them by the all-pervading principle of polarity, which manifests

...ost approved authorit
Huxley, Haeckel, and Professor C
New Chemistry in the Internatic
For the religious and philosophic
myself responsible; for, although
greatest possible pleasure and p
Spencer's writings, I had arrived at
clusions independently before I ha
works. I can only hope that I may
presenting a good many abstruse que
form, intelligible to the average n
readers, and calculated, if it teaches
teach them a practical philosophy
tolerance and charity, and assists th

Sermons in stones and good in ev

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PRACTICAL ...

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A MODERN ZOROASTRIAN.

CHAPTER I.

INTRODUCTORY.

Experiment with magnet—Principle of polarity—Applies universally—Analogies in spiritual world—Zoroastrian religion—Changes in modern environment—Require corresponding changes in religions and philosophies.

SCATTER a heap of iron filings on a plate of glass; bring near it a magnet, and tap the glass gently, and you will see the filings arrange themselves in regular forms.

If one pole only of the magnet is brought near the glass the filings arrange themselves in lines radiating from that pole.

Next lay the bar-magnet on the glass so that the filings are influenced by both poles; they will arrange themselves into a series of regular curves.

In other words, the Chaos of a confused heap of inert matter has become a Cosmos of harmonious arrangement assuming definite form in obedience to law.

As the old saying has it, that 'every road leads to Rome,' so this simple experiment leads up to a principle which underlies all existence knowable to human faculty—that of Polarity. Why do the iron filings arrange

little particle of iron is convert
with two opposite poles attracti
What is a magnet? It is a
the more general principle of pol
when it passes from the passive
active state, does so under the co
opposite and conflicting energies
reaction, no positive without a ne
it in the simplest form in our m
without a South Pole—like ev
attracting unlike. The magnet,
sidered as a special form of electri
electric current through a coil of
a bar of soft iron, the bar is at
magnet; so that a magnet may
summing up, at two opposite

[redacted]

›nversely, as polarity produces definite structure. so ›finite structure everywhere implies polarity.

The same principle prevails not only throughout the organic or world of matter, but throughout the organic world of life, and specially throughout its highest anifestations in human life and character, and in the ghest products of its evolution, in societies, religions, ıd philosophies. To show this by some familiar and riking examples is the main object of this book.

But here let me interpose a word of caution. I ust avoid the error which vitiates Professor Drummond's interesting work on 'Natural Law in the)iritual World,' of confounding analogy and identity. ›causc the principle of polarity pervades alike the ıtural and spiritual worlds, I am far from assuming at the laws under which it acts are identical; and at virtue and vice, pain and pleasure, ugliness and auty, are products of the same mathematical changes sign and inverse squares or cubes of distances, as gulate the attractions and repulsions of molecules and oms. All I say is, that the same pervading principle ay be traced wherever human thought and human ıowledge extend; that it is apparently, for some ason unknown to us, the essential condition of all :istence within the sphere of that thought and that ıowledge; and that what lies beyond it is the great ıknown, behind the impenetrable veil which it is not ven to mortals to uplift. In like manner, if I call yself 'a modern Zoroastrian,' it is not that I wish expect to teach a new religion or revive an old one, see Christian churches dedicated to Ormuzd, or right :verend bishops exchanging the apron and shovel-hat r the mitre and flowing robes of the ancient Magi;

ly this. All religions I take to be 'working
es,' by which successive ages and races of mer
isfy the aspirations and harmonise the know-
ich in the course of evolution have come to be
ne, their spiritual equipment. The best proof
ligion is, that it exists—i.e. that it is part of
evolution, and that on the whole it works
is in tolerable harmony with its environment.
at environment changes, when loftier views of
prevail, when knowledge is increased and the
f science everywhere extends its frontier, re-
ust change with it if they are to remain good
and not become unworkable and unbelievable
es.

of all the religious hypotheses which remain
in the present state of human knowledge, that
me the best which frankly recognises the

[redacted]

braces, in a wider synthesis, all that is good in other philosophies and religions.

When I talk of our new environment, it requires one who, like the author, has lived more than the Scriptural threescore and ten years, and has, so to speak, one foot on the past and one on the present, to realise how enormous is the change which a single generation has made in the whole spiritual surroundings of a civilised man of the nineteenth century. When I was a student at Cambridge, little more than fifty years ago, Astronomy was the only branch of natural science which could be said to be definitely brought within the domain of natural law. And that only as regards the law of gravity, and the motions of the heavenly bodies, for little or nothing was known as to their constitution. Geology was just beginning the series of conquests by which time and the order and succession of life on the earth have been annexed by science as completely as space by astronomy; and theories of cataclysms, universal deluges, and special recent creations of animals and man, still held their ground, and were quoted as proofs of a universe maintained by constant supernatural interference.

And when I say that space had been annexed to science by astronomy, it was really only that half of space which extends from the standpoint of the human senses in the direction of the infinitely great. The other equally important half which extends downwards to the infinitely small was unknown, or the subject only of the vaguest conjectures.

Chemistry was, to a great extent, an empirical science, and molecules and atoms were at best guesses at truth, or rather convenient mathematical abstractions

laws of the indestructibility of m
forces, and the conservation of e
or only just beginning to be fores
life, protoplasm was a word u
biology, zoology, and botany we
and the gradual building up of all
speck of protoplasm, through a pr
even suspected. Above all, the w
not been published, and evolution
general law of modern thought; no
of the antiquity of man, and of his
upwards from the rudest origins, s
ments established beliefs as to his
creation.

Science and miracle have been
battle during the last fifty years
line, and science has been at ever
Miracle, in the sense in which our
it, has been not only repulsed, but
pletely, that really little remains but

The result of these discoveries h
greater change in the

[redacted]

great corresponding changes which this period has witnessed in the practical conditions of life and of society. If astronomy and geology have extended the dominion of the mind over space and time, steamers, railways, and the electric telegraph have gained the mastery over them for practical purposes. Commerce and emigration have assumed international proportions, and India, Australia, and America are nearer to us, and connected with us by closer ties, than Scotland was to England in my schoolboy days. Education and a cheap press have even in a greater degree revolutionised society, and knowledge, reaching the masses, has carried with it power, so that democracy and free-thought are, whether for good or evil, everywhere in the ascendant, and old privileges and traditions are everywhere decaying.

With such a great change of environment it is evident that many of the old creeds, institutions, and other organisms, adapted to old conditions, must have become as obsolete as a schoolboy's jacket would be as the comfortable habiliment of a grown-up man. But as a lobster which has cast its shell does not feel at ease until it has grown a new one, so thinking men of the present day are driven to devise, to a great extent each for themselves, some larger theory which may serve them as a 'working hypothesis' with which to go through life, and bring the ineradicable aspirations and emotions of their nature into some tolerable harmony with existing facts.

To me, as one of those thinking units, this theory, of what for want of a better name I call 'Zoroastrianism,' has approved itself as a good working theory, which reconciles more intellectual and moral difficulties, and affords a better guide in conduct and practical life

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sured that the process of evolutio...

The old order changes, givin...

can best be assisted by the honest ...
sion of the results of individual th...
on the part of any one of those un...
form the complicated organisms of ...
sophies, of societies and of humanit...

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CHAPTER II.

POLARITY IN MATTER—MOLECULES AND ATOMS.

Matter consists of molecules—Nature of molecules—Laws of their action in gases—Law of Avogadro—Molecules composed of atoms—Proved by composition of water—Combinations of atoms—Elementary substances—Qualities of matter depend on atoms—Dimensions and velocities of molecules and atoms—These are ascertained *facts*, not theories.

If in building a house that is to stand when the rains fall and the winds blow, it is requisite to go down to the solid rock for a foundation, so much the more is it necessary in building up a theory to begin at the beginning and give it a solid groundwork. Nine-tenths of the fallacies current in the world arise from the haste with which people rush to conclusions on insufficient premises. Take, for instance, any of the political questions of the day, such as the Irish question: how many of those who express confident opinions, and get angry and excited on one side or the other, could answer any of the preliminary questions which are the indispensable conditions of any rational judgment? How many marks would they get for an examination paper which asked what was the population of Ireland; what proportion of that population was agricultural; what proportion of that agricultural population consisted of holders of small tenements; what was the scale of rents compared with that for small holdings in other countries;

...and passionate theories a
was based on no more solid fo
or dislike of a particular states
party.

I propose therefore to begin
taking the simplest case, that
matter, show how the material u
the operation of the all-pervadi
What does matter consist of? Of
cules are made up of atoms, and t
or parted, and built up into the
material universe, primarily by pol

Let me endeavour to make thi
intelligent but unscientific reader.
mid of Cheops shown for the f
whose eye was on such a scale tha
cern it as a separate object. He m
of ingenious conjectures as to its n
scopes had been invented in Giant-
through one, he would find that it
by layer, on a regular plan and in d
angles, by molecules ...

[redacted]

bar of iron, as capable of being magnetised, and showing the same qualities and behaviour under chemical tests as the original bar of iron from which the filings were taken. This carries us a long way down towards the infinitely small, for mechanical division and microscopic visibility can be carried down to magnitudes which are of the order of $\frac{1}{100000}$th part of an inch.

But this is only the first step; to understand our molecules we must ascertain whether they are infinitely divisible, and whether they are continuous, expanding by being spread out thinner and thinner like gold-beater's skin: or are they separate bodies with intervals between them, like little planets forming one solar system and revolving in space by fixed laws. Ancient science guessed at the former solution and embodied it in the maxim 'that nature abhors a vacuum': modern science proves the latter.

In the first place bodies combine only in fixed proportions, which is a necessary consequence if they consist of definite indivisible particles, but inconceivable if the substance of each is indefinitely divisible. Thus water is formed in one way and one only: by uniting one volume or molecule of oxygen with two of hydrogen, and any excess of one or the other is left out and remains uncombined. But if the molecules could be divided into halves, quarters, and so on indefinitely, there can be no reason why their union should take place always in this one proportion and this only.

A still more conclusive proof is furnished by the behaviour of substances which exist in the form of gases. If a jar is filled with one gas, a second and third gas can be poured into it as readily as into a vacuum, the result being that the pressure on the sides

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and placed on the same ground, witho
: formation, and with the result only
: intensity of the fire.

Now gas is matter as much as solids o
the familiar instance of water we see tha
uestion of more or less heat whether th
sts as ice, water, or steam. The numb
:he molecules is not changed, only in the
close to one another and solidly linked
other, further removed and free to mo
ther, though still held together as a
tual attractions; and in the third, still f
that their mutual attraction is lost ar
ut, each with its own proper motion,
surface which contains them, and by
their impacts producing pressure.

In this latter and simpler form of gas
s are found to prevail universally for al
der like conditions volumes vary directl
ature and inversely as the pressure. T
pressure which contains them remaini

[redacted]

half or one third, if the pressure is doubled or tripled. From these laws the further grand generalisation has been arrived at, that all substances existing in the form of gas contain the same number of molecules in the same volume.

This, which is known as the Law of Avogadro, from the Italian chemist by whom it was first discovered, is the fundamental law of modern chemistry, and the key to all certain and scientific knowledge of the constitution of matter and of the domain of the infinitely small, just as much as the law of gravity is to action of matter in the mass, and the resulting conditions and motions of mechanics and astronomy.

This conclusion obviously follows from it, that difference of weight in different substances arises not from one having more molecules in the same volume than another, but from the molecules themselves being heavier. If we weigh a gallon or litre of hydrogen gas, which is the lightest known substance, and then weighing an equal volume of oxygen gas find that it is sixteen times heavier, we know for certain that the molecule or ultimate particle of oxygen is sixteen times heavier than that of hydrogen.

It is evident that in this way the molecules of all simple substances which can exist in the form of pure gas can be weighed, and their weight expressed in terms of the unit which is generally adopted, that of the molecule of the lightest known substance, hydrogen. But science, not content with this achievement, wants to know not the relative weight only, but the absolute dimensions, qualities, and motions of these little bodies; and whether, although they cannot be divided further by mechanical means, and while retaining the qualities

bstances they build up, they are really ultimate visible particles or themselves composites.

istry and electricity give a ready answer to r question. Molecules are composites of still odies, and to get back to the ultimate particle go to atoms. All chemical changes resolve es into the breaking up of molecules and re- ent of their constituent atoms. If the opposite a voltaic battery are inserted in a vessel con- water, molecules of water are broken up, of gas rise at each pole, and if these are col- he gas at the positive pole is found to be and that at the negative pole hydrogen. No- been added or taken away, for the weight of ases evolved exactly equals that of the water s disappeared. But the molecules of the water n broken up, and their constituents reappear y different forms, for nothing can well be

[redacted]

The only thing which is compound in the composi- ɔn of oxygen is that its molecules consist of two atoms ıked together. This appears from the fact that while e weight of oxygen, and therefore that of its mole- les, is sixteen times greater than that of an equal ılume of hydrogen, and therefore of hydrogen mole- les, it combines with it in the proportion not of six- ən, but of eight to one. If, therefore, the molecule ɜre identical with the atom of oxygen, we must mit that the atom could be halved, which is con- ary to its definition as the ultimate indivisible particle the substance oxygen. But if the oxygen molecule nsists of two linked atoms, O—O, and the hydrogen olecule equally of two, H—H, as can be proved by her considerations, everything is explained by assum- g that the molecule of water consists of two atoms of ydrogen linked to one of oxygen, or H_2O, and that hen this molecule is broken up by electricity, its con- ituents resolve themselves into atoms, which recom- ne so as to form twice as many molecules of hydrogen, —H, as of oxygen, O_2—i.e. into two volumes of ydrogen gas to one of oxygen.

Taking the single hydrogen atom as the unit of eight as being the lightest known ponderable body, ıd calling this weight a microcrith, or standard of the nallest of this order of excessively small weights, this equivalent to saying that the weight of an oxygen om is equal to 16 microcriths, and as water is com- ɔsed of one such atom plus two of hydrogen, the eight of its molecule ought to be 16+2=18, which in fact the exact ratio in which the weight of a ɔlume of steam, or water in the form of gas, is heavier ıan an equal volume of hydrogen.

..g different substan
proportion which is either 16, o
such as 32, 48, 64. That is, eit
of oxygen unite with other atoms
from which these other substances

One atom of oxygen weighing
bines, as we have seen, with tw
weighing 2, to form a molecule
18 mc. In like manner one aton
combines with one of carbon, whi
form a molecule of carbonic oxide w
two of oxygen, 32 mc., with one c
form a molecule of carbonic dioxide

The same applies to all elementar
hydrogen, two atoms of which co
oxygen to form water, combines on
chlorine to form the molecule of hyd
weighs 36·5 mc., being the united w
of chlorine, 35·5 mc., and one o
These, with hundreds of similar
results not of theories as to molecu
of actual facts, ascertained by innum
made indep...

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known to us with regard to the attractions and motions of matter in the mass. But as Newton's law enables us to predict new facts, to calculate eclipses and the return of comets beforehand, and to compile nautical almanacs; so the new chemistry, based on the atomic theory, affords the same conclusive proof of its truth by enabling us in many cases to predict phenomena which are subsequently verified by experiment, and to infer beforehand what combinations are possible, and what will be their nature.

The actual existence, therefore, of molecules and atoms is as well-ascertained a fact, as that of cwts. and lbs., or of planets and stars, of solar systems and nebulæ.

The researches of chemists have succeeded in discovering about 70 substances, of which the same may be said as of the oxygen and hydrogen into which water is decomposed, viz. that they cannot be decomposed by any known process, and must therefore be considered as ultimate and elementary. Their atoms differ widely in size and weight: that of mercury, for instance, being 200 times heavier than that of hydrogen, and the weights varying from 1 mc. for the hydrogen atom, up to 240 for that of uranium. When we call them elementary substances, we merely mean that we know no means of decomposing them. It is possible that all of them may be compounds which we cannot take to pieces of some substratum of uniform matter, and it is remarkable that the weight of nearly all of these elementary atoms is some simple multiple of that of hydrogen, pointing to their being all combinations of one common substratum of matter; but this is merely conjecture, and in the present state of our knowledge we must assume these 66 or 71 ultimate particles

..., 5 are abu
the remainder are either know
minute quantities, or exist in
tities, having no very materia
relation to matter. The most
hydrogen, nitrogen, and carbon
nitrogen gives us the air we b
hydrogen the water we drink, anc
primitive bases the solid earth
Carbon again is the great basis of
life, to which it leads up by a var
binations with oxygen, hydrogen,

The qualities and relations c
afford a subject of great interes
extent that those who wish to ur
referred to professed works on moc
the present purpose it is suffici
following conclusions are firmly es

All the various forms of mat
combinations of primitive atoms w
the molecules being neither more
small pieces of ordinary matter.

The qualities of

[redacted]

nite weight and is indestructible. No man by taking thought can add the millionth of a milligramme to the weight of any substance, or make it either more or less than the sum of the weights of its component factors, any more than he can add a cubit to his stature. When Shelley sang of the cloud,

I change, but I cannot die,

he enunciated a scientific axiom of the first importance. Creation, in the sense of making something out of nothing, is a thing absolutely unknown and unknowable to us. If we say we *make* a ship or a steam-engine, we simply mean that we transform existing matter and existing energies into new combinations, which give results convenient for our purpose. So if we talk of making a world, our idea really is that if our powers and knowledge were indefinitely increased we might be able, given the atoms and energies with their laws of existence, to put them together so as to produce the desired results. But how the atoms and their inherent laws got there is a question as to which knowledge, or even conceivability, is impossible, for it altogether transcends human experience.

Before finally taking leave of atoms it may be well to state shortly that science, not content with having proved their existence and weighed them in terms of the lightest element, the hydrogen atom, has attempted, not without success, to solve the more difficult problem of their real dimensions, intervals, and velocities. This problem has been attacked by Clausius, Sir W. Thomson, Clerk Maxwell, and others, from various sides: from a comparison with the wave-lengths of light; with the tenuity of the thinnest films of soap-bubbles just before

... the resulting p
surface. All these methods inv
matical calculations that it is im
popularly, but they all lead to
which involve figures so marv
incomprehensible. For instance
air is calculated to contain 21 t
i.e. 21 times the cube of a million
ciphers; the average distance b
equals 95 millionths of a millim
25 times smaller than the small
under a microscope; the average v
cule is 447 metres per second; and
of impacts received by each molecul
millions.

[redacted]

CHAPTER III.

ETHER.

Ether proved by light—Light-waves—Elasticity of ether—Its universal diffusion—Influences molecules and atoms—Is influenced by them—Successive orders of the infinitely small—Illustrated by the differential and integral calculus—Explanation of this calculus—Theory of vortex rings.

PERHAPS the best way to convey some idea of this order of magnitudes to the ordinary reader is to quote Sir W. Thomson's illustration, that if we could suppose a cubic inch of water magnified to the size of the earth—i.e. to a sphere 24,000 miles in circumference—the dimensions of its ultimate particles, magnified on the same scale, or, as he expresses it, its degree of coarse-grainedness, would be something between the size of rifle-bullets and cricket-balls.

Extraordinary as these dimensions are, they are not more so than those at the opposite extremity of the scale, where the distance of stars and nebulæ has to be measured by the number of thousand years their light, travelling at the rate of 192,000 miles per second, takes to reach us. Infinitely small, however, as those dimensions appear to our original conceptions derived from our natural senses, they are certain and ascertained facts, if not as to the precise figures, yet beyond all doubt as to the orders of magnitude. In dealing with them also we are to a great extent on familiar ground.

..p ordinary matter, and as s
pyramids.

But to understand the cons
universe we must go a step
familiar world of sense, and dea
medium, which is at the same
matter, which lies outside the law
obeys other laws intelligible and
which it may be said we know it
We call it Ether.

Ether is a medium assumed a
quence from the phenomena of li
tricity—primarily from those of
light two facts are known to us wit

1st. It traverses space at the ra
per second.

2nd. It is propagated not b
travelling at this rate, but, like so
the transmission of waves.

The first fact is known from t
at which eclipses of Jupiter's satel
ing as the earth is at the

[redacted]

The second fact is equally certain from the phenomena of what are called interferences, when the crest of one wave just overtakes the hollow of a preceding one, so that, if the two waves are of equal magnitude, the oscillations exactly neutralise one another, and two lights produce darkness. This is shown in a thousand different ways, and for all the different colours depending on different waves into which white light is analysed when passed through a prism. It is a certain result of wave-motion, and of wave-motion only, and therefore we know without a doubt that light is propagated by waves.

But waves imply a medium through which wave-forms are transmitted, for waves are nothing but the rhythmic motion of something which rises and falls, or oscillates symmetrically about a mean position of rest, slowly or quickly according to the less or greater elasticity of the medium. The waves which run along a large and slack wire are large and slow, those along a small and tightly stretched wire are small and quick; and from the data we possess as to light, its velocity of transmission, its refraction when its waves pass from one medium into another of different density, and from the distance between the waves as shown by interference, it is easy to calculate the lengths and vibratory periods of the waves, and the elasticity of the medium through which such waves are transmitted.

The figures at which we arrive are truly extraordinary. The dimensions and rates of oscillations of the waves which produce the different colours of visible light have been measured and calculated with the greatest accuracy, and they are as follows:

. . .	42,000
Yellow . . .	44,000
Green	47,000
Blue	51,000
Indigo	54,000
Violet	57,000

The elasticity of this wonder
more extraordinary.

The rapidity with which wave-m
depends, other things being equal,
the medium, which is proportional
velocity with which a wave travels t
velocity of the sound-wave in air is
a second, and that of the light-wa
miles in the same time, it follows
the latter is about a million times g
the former, and if the density of ethe
that of air, its elasticity must be abo
times greater. But the elasticity is
the power of resisting compression
of air we know to be about 15 pou
inch; so that the ether, if equally de
a pressure of 15 million million

[redacted]

L00 miles an hour is a hurricane uprooting trees and elling houses. If ether were as dense as air the istance to the earth in passing through it would be) times that of going dead to windward in a tropical rricane. But in point of fact there is no sensible istance, for the earth and heavenly bodies move in ir calculated paths according to the law of gravity actly as they would do if they were moving in a cuum. Even the comets, which consist of such cessively rare matter that when one of them got tangled among the satellites of Jupiter it did not ect their movements, are not retarded by the ether, so slightly, that any retardation in the case of one or o of them is suspected rather than proved. But, if ether has no weight, how can we call it material, ight being, as we have seen, the invariable test and asure of all matter down to the minutest atom? And how can we deny its existence when it is demonably necessary to account for undoubted facts realed to us every day by the prism, the spectroscope, ctricity, and chemical action, and deductions from se facts based on the strict laws of mathematical culation? For the existence of the ether is not based ly on the phenomena of light: it is an equally neces-y postulate to explain those of heat, electricity, and mical action. We must conceive of our atoms and lecules as forming systems and performing their vements, not in vacuo, but in an all-pervading dium of this ether, to which they impart, and from ich they receive, impulses.

These impulses are excessively minute, and when y occur in irregular order they produce no apprebie effect; but when the vibrations of the ether keep

. ..y ripples may set a
and the footfalls of a regiment o
a suspension-bridge may make i
down, while a confused mob cou
The latter affords a good illus
which molecular structures may
their atoms set free to enter into
the action of heat, light, or chem
visible end of the spectrum.

Conversely the phenomena of
depend on the fact that the vibr
molecules can propagate waves th
well as absorb ether-waves into thei
thus give spectra distinguished by
peculiar to each substance, by which
Whatever ether may be, this much
it pervades all space. That it exten
of the infinitely great we know fron
reaches us from the remotest stars a
in this light the spectroscope enable
propagated and absorbed by the ve
of the same familiar atoms ...

[redacted]

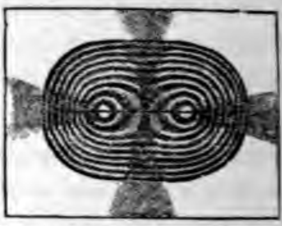
ite movements in an atmosphere of it, as is shown by ie fact that in so many cases light and heat penetrate irough them. A whole series of remarkable phenoiena arise from the manner in which the vibrations of :her which cause light are affected by the structure of ie molecules of crystals through which they pass. In ertain cases they are what is called polarised, or so ffected that while they pass freely if the crystal is held ı one direction, they are stopped if it is turned round irough an angle of 90° to its former position, so that ne and the same crystal may be alternately transparent ad non-transparent. It would seem as if its structure 'ere like that of wood, grained, and more easy to pene-ate if cut with the grain than against it, so that when ray of light attempted to penetrate, its vibrations were esolved into two, one with the grain which got through, ie other against it which was suppressed; so that the nerging ray, which entered with a circular vibration, ot out with only one rectilinear vibration parallel to the iameter which coincided with the grain.

Other crystals of more complicated structure affect ansmitted light in a more complex way, developing a ouble polarity very similar to that induced in the iron lings when brought under the influence of the two poles f the magnet. With this polarised light the most beau-ful coloured rings can be produced from the waves of ie different colours into which the white light has been ıalysed in passing through the crystal, which alter-ıtely flash out and disappear as the crystal is turned ›und its axis, and which present a remarkable analogy › the curves into which the iron filings form them-elves under the single or double poles of the magnet.

The importance of this will appear afterwards, but for

ent it is sufficient to show that the waves of ether
use light really penetrate through the molecules
ls, but in doing so may be affected by them.

POLARISED LIGHT,
XIAL CRYSTALS.



RINGS OF POLARISED LIGHT,
BIAXIAL CRYSTALS.

ealing with these excessively small magnitudes
assist the reader who has some acquaintance
thematics in forming some conception of them,
to that refinement of calculation, the differen-
integral calculus. And even the non-mathe-
reader may find it worth while to give a little

[redacted]

error is an excessively small part of the true figure, and the second error a still more excessively small part of the first error. But, as we are dealing with abstract numbers, we can just as readily conceive our initial error to be the $\frac{1}{100}$th or $\frac{1}{1000}$th of an inch, as one inch; and, in fact, diminish it until it becomes an infinitesimally small or evanescent quantity. In doing so, however, it is evident that we shall make the second error such a still more infinitesimally small fraction of the first that it may be considered as altogether disappearing.

The first error is called a differential of the first order and denoted by d, the second a differential of the second order denoted by d_2. Thus if we call the base of our rectangle x and its height y, the area will be xy. Let us suppose x to receive the addition of a very small increment dx, and y the corresponding increment dy, what will be the corresponding increment of the area, or $d.xy$? Clearly the difference between the old area xy and the new area $(x + dx)$ multiplied by $(y + dy)$. This multiplication gives

$$\begin{array}{l} x + dx \\ \underline{y + dy} \\ xy + y\,dx \\ \quad\;\; \underline{x\,dy + dx.dy} \\ xy + x\,dy + y\,dx + dx.dy \end{array}$$

The difference between this and xy is $x\,dy + y\,dx + dx.dy$. But $dx.dy$ is, as we have seen, a differential of the second order and may be neglected. Therefore $dxy = x\,dy + y\,dx$. In like manner $dx^2 = (x + dx)^2 - x^2 = 2\,x\,dx + dx^2$, which last term may be neglected, and $dx^2 = 2\,x\,dx$. In this way the differentials of all manner of functions and equations of symbols representing

ons and motions may be found. Conversely
oles may be considered as made up of an
number of these infinitely small parts, and
rom them by summing up or integrating the
tials. Thus if we had the equation

$$x\,d\,y + y\,d\,x = 2\,z\,d\,z$$

that the left-hand side is the differential of $x\,y$,
refore that by integrating it we shall get $x\,y$;
e right side is the differential of z^2 which we
et by integrating it. The relation expressed
e is that $x\,y = z^2$, or, in other words, that a rect-
hose sides are x and y exactly equals a square
ide is z.

use of this device in assisting calculation will
rent if we take the case of an area bounded by
l line. We cannot directly calculate this area,

[redacted]

$\mathrm{N}n = y\,dx$, and differs from the true curvilinear area $\mathrm{P}pn\mathrm{N}$ by less than the little rectangle of $\mathrm{P}q \times pq$ or of $dx.dy$. But, as we have seen, if we push our division to the first infinitesimal order, or make $\mathrm{N}n$ and pq differentials of x and y, $dx.dy$ may be neglected—i.e. multiply the number of rectangles indefinitely, and the sum of their areas will differ from the true area inclosed by the curve by an error which is evanescent.

If then x and y are connected by some fixed law, as must be the case if the extremity of y traces out some regular curve, the relation between them may be expressed by an equation, which will remain one however often it may be differentiated or again integrated, and whatever modifications or transformations it may receive by mathematical processes which do not alter the essential equality of the two sides connected by the symbol of equality $=$. Thus by differentiating and casting off as evanescent all differentials of a lower order than that which we are working with, we may arrive at forms of which we know the integrals, and by integrating get back to the results in ordinary numbers, which we were in search of but could not attain directly.

The same thing will apply if our symbols are more numerous, and if they express relations of motion as well as of space, or, in fact, any relations which are governed by fixed laws expressible by equations. If I have succeeded in conveying to the readers any idea of this celebrated calculus, they will perceive what an analogy it presents to the idea of modern physical and chemical science, that of molecules, atoms, and ether, forming differentials of successive orders of the infinitely small. It is certainly most remarkable that while the former was a purely intellectual idea based

ematical abstractions, and which was invent
rked as an instrument for solving the mo
astronomical problems for nearly two centurie
a suspicion that it represented any objecti
the latter idea, based on actual experimen
show that differentials and integrals have the
nterpart in nature and represent fundament
the constitution of the universe.

e who are of a mystic or metaphysical turn
y discern in this, arguments for matter and la
r being after all only manifestations of o
l, all-pervading mind; but in following su
ons we should be deserting the solid earth f
d, and passing the limit of positive knowled
region where reflections of our own hopes, fea
feelings, and poetical sentiments form and di
emselves against the background of the gre

[redacted]

the blowing of soap-bubbles gives the best clue to the movement of waves of light, and through them to the dimensions of molecules and atoms; and the collision of billiard-balls, knocked about at random, to the movements of those minute bodies, and the kinetic theory of gases. In the case of the vortex theory the idea is given by the rings of smoke which certain adroit smokers amuse themselves by puffing into the air. These rings float for a considerable time, retaining their circular form, and showing their elasticity by oscillating about it and returning to it if their form is altered, and by rebounding and vibrating energetically, just as two solid elastic bodies would do, if two rings come into collision. If we try to cut them in two, they recede before the knife, or bend round it, returning, when the external force is remove , to their original form without the loss of a single particle, and preserving their own individuality through every change of form and of velocity. This persistence of form they owe to the fact that their particles are revolving in small circles at right angles to the axis or circumference of the larger circle which forms the ring; motion thus giving them stability, very much as in the familiar instance of the bicycle. They burst at last because they are formed and rotate in the air, which is a resisting medium; but mathematical calculation shows that in a perfect fluid free from all friction these vortex rings would be indivisible and indestructible: in other words, they would be atoms.

The vortex theory assumes, therefore, that the universe consists of one uniform primary substance, a fluid, which fills all space, and that what we call matter consists of portions of this fluid which have become

mass, and mode of motion.
disappear, nor can they be form
of the same kind are constitute
and therefore are endowed with

The theory is a plausible
of its authors must comman
sideration; but it is as yet a lo
established theory which can
representation of facts. In the
solely on mathematical theory, a
of atoms and light-waves, upon
and measurement tested by exp
mathematical reasoning affords
plement. No one has proved th
medium or of such vortex rings,
measured them.

Moreover the theory is open
objections. How can aggregati
matter acquire weight, and becom
gravity, which, as we have seen,
and permanent qualities of atoms
of a millimetre of

[redacted]

volving through it with immense velocities? w could these innumerable vortex rings be ıt of the ether without disturbing the uniıd continuity of the medium, which are essene propagation of the light-waves through it? could the motions requisite to form the vortex mpressed on them *de novo* consistently with ple of the conservation of energy? Energy ore be created out of nothing than matter, ɔcess known in nature or conceivable by the ellect; and to assume it is simply a more reıer of falling back on the supernatural, which ly a more refined manner of saying that we ıing.

e present, therefore, we must be content with l ether as the ultimate terms of our knowhe material or quasi-material components of se.

CHAPTER IV.

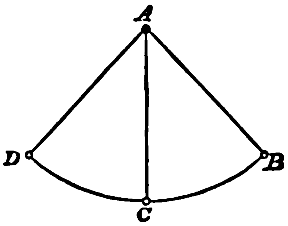
ENERGY.

f motion and of position—Energy can be transformed, not l or destroyed—Not created by free will—Conservation of me-l power—Convertibility of heat and work—Nature of heat—eam-engine—Different forms of energy—Gravity—Molecular —Chemical energy—Dynamite—Chemical affinities—Electricity uced by friction—By the voltaic battery—Electric currents—ht—Induction—Magnetism—The magnetic needle—The electric ph—The telephone—Dynamo-electric engine—Accumulator.

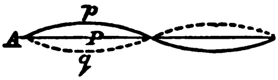
[redacted]

ordered and harmonious arrangements of the universe depend on the polarity, or conflict with alternate victories and defeats, between those two forms of energy.

Thus if A B is a pendulum suspended at the point A, if we move it from its position of rest A C to A B and hold it there, its whole energy is that of position. If we let it go it swings backwards and forwards between the positions A B and A D, and but for the resistance of the air and the friction at the point of suspension, it would so swing for ever. But in thus swinging what happens? From A B to A C energy of motion keeps gaining on energy of position, until when the pendulum reaches C, it has annihilated it. Energy of position has entirely disappeared, and the whole original force expended in raising the pendulum to A B exactly reappears in the force or momentum of the pendulum at its lowest point. But is this victory final? By no means; energy of position having touched bottom, gathers, like Antæus, fresh vigour for the contest, and from the position A C upwards it gains ground on its adversary until when the pendulum reaches A D it is in its turn completely victorious.



The same alternation between energy of motion and of position takes place in all rhythmical movements such as waves, which, whether in water, air, or ether, are propagated, as in the case of the pendulum, by particles forced out of their position of rest and oscillating between the two energies.



beginning with nothing but en
losing it all for energy of motio
it at *q*. All wave-motions ther
all sound, light, and heat—depe
polarity.

If we have got this definition
energy clearly into our heads, we sh
pared for this further generalisation
haps, in the whole range of modern s
like matter, is indestructible, and
formed, but never created or annihi

This is at first sight a more dif
establish in the case of energy than
the latter case we have nothing in
can lead us to suppose that we hav
thing out of nothing; but in th
impression undoubtedly is that we
I throw a stone at a bird I h
sion that

[redacted]

n image of the bird; this sends vibrations along the ptic nerve to the brain, setting in motion certain moleules of that organ; these again send vibrations along ther nerves to certain muscles of the arm and hand, rhich contract, and by doing so give out the energy of novement which throws the stone. All this process s strictly mechanical; the eye acts precisely like a amera obscura in forming the image; the nerve-vibraions, though not identical with those of the wires of n electric telegraph, are of the same nature, their elocity can be measured, and their presence detected y the galvanometer; the energy of the muscle is tored there by the slow combustion of the food we ave eaten, in the oxygen of the air we have breathed. 'ake any of these conditions away, and no effort of the rill can produce the result. If the nerve is paralysed, r the muscle, from prolonged starvation, has no energy ɛft, the stone will not be thrown, however much we nay desire to kill the bird.

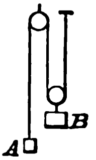
Again, precisely the same circle of events takes lace in numerous instances without any intervention f this additional factor of conscious will. We breathe nechanically, the muscles of the chest causing it to rise nd fall like the waves of the ocean, without any delierate intention of taking air into the lungs and exaling it. Nay more, there are instances of what was t first accompanied by the sensation of conscious will, easing to be so when the molecular movements had nade channels for themselves, as when a piano-player, 'ho had learned his notes with difficulty, ends by laying a complicated piece automatically. The case f animals also raises another difficulty. Suppose a etriever dog sees his master shoot at and miss a hare:

obey the promptings of his animal instinct and se, or those of his higher moral nature which that it is wrong to do so without the word of d? It is hard to see how this differs from the a man resisting or yielding to temptation; and we assign conscious will to the man, we can o the dog.

oning from these premises, some philosophers ne to the conclusion that man and all animals mechanical automata, cleverly constructed to a certain way fitting in with the equally pre- course of outward phenomena; and that the of will is merely an illusion arising as a last nt in the adjustment of the machinery. But es in that principle of duality or polarity, by proposition may be at once true and untrue, contradictory opposites exist together. No

[redacted]

In the case of ordinary mechanical power it had been ng known that the intervention of machinery did not 'eate force, but only transformed it. If a weight of lb., A, just balances a weight of 2 lb., B, by aid of a ılley, and by the addition of a minute fraction, such ; a grain, raises it 1 foot, it will be invari- ɔly found that A has descended 2 feet. In :her words, 1 lb. working through 2 feet ɔes exactly the same work as 2 lbs. working ırough 1 foot. And whatever may be the ıtervening machinery the same thing holds



ood, and the work put in at one end comes out, neither ıore nor less, at the other, except for a minute loss due ɔ friction and resistance of air. If a force equal to 1 lb. ; made, by multiplying the intermediate machinery, to aise a ton a foot from the ground, exactly as much ɔrce must have been exerted as if the ton had been ivided into 2,240 parts of 1 lb. each, and each part eparately lifted.

But although energy cannot be created, at first sight ; seems as if it might be destroyed, as when the ton falls ɔ the ground and seems to have lost all its energy, ⁊hether of motion or of position. But here science teps in and shows us that it is not destroyed, but simply ransformed into another sort of motion, which we call eat.

Some connection between mechanical work and heat ad long been known, as in the familiar experiment of ubbing our hands together to warm them; and the ractice known to most primitive races of obtaining fire y twirling a stick rapidly in a hole drilled in a block f wood; a practice described by the old Sanskrit word pramantha,' which means an instrument for obtaining

ressure or friction, and which, translated into
as been immortalised by the legend of Pro-
. But it was reserved for recent years, and for
lish philosopher, Dr. Joule, to give scientific
and generality to this idea, by actually measur-
mount of heat produced by a given amount of
d showing that they were in all cases convert-
s, so much heat for so much work, and so much
so much heat. He did this by measuring
y by a thermometer the heat added to a given
f water by the work done by a set of paddles
in it, set in rapid motion by a known weight
ng through a known space. The unit of work
ken as that sufficient to raise 1 kilogramme
1 metre, and that of heat as that required to
temperature of one kilogramme of water by 1°
de, the relation between them, as found by a

[redacted]

gives much greater precision to our ideas respecting the real nature of heat and its kindred molecular and atomic energies. Heat is clearly not a material substance, for a body does not gain weight by becoming hotter. In the case of all ponderable matter down to the atoms, which are only of the size of cricket-balls compared to that of the earth, any combination which adds matter adds weight, and the weight of the product exactly equals the sum of the weights of the separate factors which have united to form it. Thus, if iron is burnt in oxygen gas, the product, oxide of iron or rust, weighs more than the original iron by just as much as the weight of the oxygen which has been consumed. But heat, light, and electricity add nothing to the weight of a body when they are added to it, and take nothing away when they are subtracted. The inference is unavoidable that heat, like light, is not ponderable matter, but an energy transmitted by waves of the imponderable medium known as ether. This is confirmed by finding that when a ray from the sun is analysed by passing through a refracting prism, one part of the spectrum shows light of various colours, while another gives heat. The hottest part of the spectrum lies in the red and beyond it, showing that the heat-waves are longer, and their oscillations slower, than those of light. Heat-waves also may be made to interfere, and to become polarised, in a manner analogous to the phenomena exhibited by those of light.

There can be no doubt, therefore, that heat, like light, is an energy or mode of motion, transmitted by waves of an imponderable ether, and that it acts on the molecules and atoms of matter by the accumulated successive impulses of those waves on the molecules and atoms

re floating in it, or rather which are revolving definite groups and fixed orbits, like miniature stems or starry universes. We can now see t performs work, and why work can be transnto it.

performs work in two ways. First, it expands that is, it draws their molecules farther apart he force of cohesion which binds them together them moving in definite orbits at definite dis. It is as if it increased the velocity, and therecentrifugal force of a system of planets, and so hem to revolve in wider orbits. The expansion ry in a thermometer affords a familiar instance effect of heat and the readiest measure of its Secondly, it increases the energy of the moleotions, so that they dart about, collide, and with greater force. Thus, as heat increases, ion increases, for molecules on the surface are

heat poured out for millions of years by the sun, is probably owing mainly to the mechanical force of contraction of the original cosmic matter condensing about the solar nucleus.

Again, when gases suddenly expand, their temperature falls, which is the principle by which artificial ice is procured, and frozen beef and mutton are brought from America and Australia, producing, such are the complicated relations of modern society, agricultural depression, fall of rents, and a serious aggravation of the Irish question.

As an example of the converse proposition of the transformation of heat into mechanical work, the steam-engine affords the aptest illustration. The original power came from the sun millions of years ago, and did work by enabling the leaves of plants to overcome the strong mutual affinity of carbon and oxygen in the carbonic dioxide in the air, and store up the carbon in the plant, where it remained since the coal era in the form of energy of position. By lighting the coal, or in other words separating its molecules more widely by heat, we enable them to exert once more their natural affinity for oxygen, and burn, that is re-combine into carbonic dioxide. The heat thus produced turns water into steam, which passes through a cylinder, either into a condenser if the steam is at low pressure, or into the outer air if it has been superheated and brought to a higher pressure than that of the atmosphere. The difference of the pressure or elasticity of the steam in the boiler, and of the same steam when it is condensed or liberated, is available for doing work, and, being admitted and released alternately at the two ends of the cylinder, drives a piston up and down, which, by means

s and shafts, turns a wheel or does whatever required of it. In doing this, heat disappears, nverted into work, and the amount of heat actly equal that into which the work would be d according to Joule's law, if it could all be without the loss necessarily incurred by friction, , and the still more important absorption of eat required to convert water at boiling-point ur of the same temperature. This latter is not annihilation of the heat, but its conversion into e in separating the molecules against the force on. The whole heat, therefore, is transformed k, mainly molecular work in tearing molecules and the residue into mechanical work turnlles and driving locomotives and steamboats. intermediate machinery here, including the the boiler, is merely the means of applying the energy in the particular way we desire. The

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heat we can see that, although matter and energy are to all appearance indestructible, the present constitution of the universe is not eternal. The animating energy of heat is always tending to obliterate differences of temperature, and bring all energy down to one uniform dead level of a common average, in which no further life, work, or motion are possible. Fortunately this consummation is far off, and for many tens or hundreds of millions of years the inhabitants of this tiny planet may feel fairly secure, and need not, like the late Dr. Cumming, of millenarian celebrity, introduce breaks in the leases of their houses to provide against the contingency of the world coming to an end at an early date.

Dismissing, then, to the remote future any speculations as to the failure of this essential element of active energy, let us rather consider the various protean forms in which it shows itself.

1. The energy of visible motion, which, as we have seen, may be transformed into an equivalent amount of energy of position.

2. Molecular energy, which causes the cohesive attraction, repulsion, and other proper motions of these minute and invisible particles of matter.

3. Energy of heat and light, which are transmitted by waves of the assumed imponderable medium called ether.

4. Energy of chemical action, by which the small ultimate particles of ponderable matter, called atoms, separate and combine into the various combinations of molecules constituting visible matter, in obedience to certain affinities, or inherent attractions and repulsions.

5. Electrical energy, which includes magnetism as a special instance.

. ... grinding dow
air transmitting sound, or of
and heat, are instances of ene
position, conflicting with one a
gaining the victory. So also a
dynamite has an immense ener
when its atoms are let loose fron
connection by heat or percussion
enormous energy of motion, v
destructive according to the ra
atoms rush into new combination

Let us consider these differen
in detail. The energy of visible
principally by the law of grav
matter attracts other matter dir
inversely as the square of the dist
and uniform law of matter, and
change or variation from the mi
remotest double star. The energy
at first sight, be considered as ano
causes of visible motion ; but, wh
will be found that what appears
result of mol...

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standing on the line waiting for it. The energy which moves the train is due entirely to the difference of heat, which has been developed by the combustion of coal, between the steam in the boiler and the steam when allowed to escape into the air; and this energy came originally from the sun, whose rays enabled the leaves of growing plants to decompose carbonic dioxide and store up the carbon in the coal. Of this force of gravity causing visible motion we may say that it is comparatively a very weak force, which acts uniformly over all distances great or small.

Molecular energies, on the other hand, act with vastly greater force, but at very small distances, and appear sometimes as attractive and sometimes as repulsive forces. Thus solid bodies are held together by a force of cohesion which is very powerful, but acts only at very small distances, as we may see if we break a piece of glass and try to mend it by pressing the broken edges together. We cannot bring them near enough to bring the molecular attraction again into play and make the broken glass solid. But the same glass acts with repellent energy if another solid tries to penetrate it, so that we can walk on a glass floor without sinking into it. Heat also, by increasing the distance between the molecules, first weakens the cohesive force so that the solid becomes fluid, and finally overcomes it altogether, so that it passes into the state of gas in which the centripetal attraction of the molecules is extinguished, and they tend to recede further and further from each other under the centrifugal force of their own proper velocities. The great energy of molecular forces will be apparent from the fact that a bar of iron, in cooling 10° Centigrade, contracts with a force equal to a ton

square inch of section, as exemplified in the bridge across the Menai Straits, where space e allowed for the free contraction and expanhe iron under changes of temperature.

nical energy, or the mutual attractions and reof atoms, is even more powerful than that of es. It displays itself in their elective affinities, may be called the likes and dislikes, or loves reds, of these ultimate particles. Perhaps the stration will be afforded by that 'latest resource sation,' dynamite. This substance, or to give cientific name, nitro-glycerine, is composed of es each of which is a complex combination of ns of oxygen, five of hydrogen, three of nitrogen, e of carbon. Of these, oxygen and hydrogen strong affinity for one another, as is seen by shing together whenever they get the chance, their union forming the very stable compound.

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If nitrogen had more affinity for oxygen it would combine chemically with it, and we should live in an atmosphere of nitrous oxide, or laughing gas.

The molecule, therefore, of nitro-glycerine resembles a house of cards, so nicely balanced that it will just stand, but will fall to pieces at the slightest touch. When this is supplied by a slight percussion the molecule falls to pieces and is resolved into its constituent atoms, which rush together in accordance with their natural affinities, forming an immense volume of gas, partly of water in the form of steam where oxygen has combined with hydrogen, and partly of carbonic dioxide where it has combined with carbon, leaving the nitrogen atoms to pair off, and revert to their original form of two-atom molecules of nitrogen gas. It is as if ill-assorted couples, who had been united by matrimonial bonds tied by the manœuvres of Belgravian mothers, found themselves suddenly freed by a decree of divorce *a vinculo matrimonii*, and rushed impetuously into each other's arms, according to the laws of their respective affinities. So striking is the similitude that one of Goethe's best-known novels, the 'Wahlverwandschaften,' takes its title from the human play of these chemical reactions. The enormous energy developed when these atomic forces are let loose and a vast volume of gas almost instantaneously created, is attested by the destructive force by which the hardest rocks are shattered to pieces and the strongest buildings overthrown.

These loves and hatreds, or, as they are termed, chemical affinities and repulsions of the atoms, are the principal means by which the material structure of the universe is built up from the original elements. The earth, or solid crust of the planet we inhabit, consists

of oxidised bases, and is due to the affinity
en for silicon, calcium, aluminium, iron, and
imary elements of what are called metals. This
enables them to make stable compounds, which,
e existing conditions of temperature and other-
ld together and are not readily decomposed.
n like manner, in all its forms of waves, seas,
vers, clouds, and invisible vapour, is due to the
between oxygen and hydrogen forming a stable
nd. Salt again is owing to the affinity of
for sodium, and so for nearly all the various
with which we are familiar, oxygen and nitro-
he air we breathe being almost the only ele-
hich exist in their primary and uncombined
any considerable quantities, and form an
part of the conditions which render our planet
ble abode for man and other forms of life.
hall see presently something more of the nature

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form and always acting in the same direction, but of two kinds, equal and opposite. If we touch the pith-ball by the excited glass rod, it will after contact be repelled ; but if we bring the ball which has been excited by contact with the glass within the influence of a stick of sealing-wax which has been excited by rubbing it with warm dry flannel, the ball instead of being repelled is attracted.

Conversely, if the pith-ball has been first touched by excited sealing-wax, it will afterwards be repelled by excited sealing-wax and attracted by excited glass. It is clear, therefore, that there are two opposite electricities, and that bodies charged with similar electricities repel, and with unlike electricities attract, one another. For convenience, one of these electricities, that developed in glass, is called positive, and the other negative; and it has been clearly proved that one cannot exist without the other, and that whenever one electricity is produced, just as much is produced of an opposite description. If positive electricity is produced in glass by rubbing it with silk, just as much negative electricity is produced upon the silk.

Another primary fact is that some substances are able to carry away and diffuse or neutralise this peculiar influence called electricity, while others are unable to do so and retain it. The former are called conductors, the latter non-conductors. Thus, glass is an insulator or non-conductor, while metal is a conductor of electricity; and the reason why the substances rubbed together, as glass and silk, must be dry is that water, in all its forms, is a conductor which carries away the electricity as fast as it is produced.

These facts have given rise to a theory—which is

not so much an explanation as a convenient expressing the facts—of the existence of two electric fluids, which, in the ordinary or unex- ly, are combined and neutralise one another, separated by friction, and flow in opposite s, accumulating at opposite poles, or, it may being accumulated at one pole, while the other d through some conducting medium and lost

The active electricity, be it positive or nega- s accumulated at one pole, and retained there ubstance in contact with it being a non-con- disturbs by its influence the electrical equili- f any body brought near to it, separates its ls, and attracts the one opposite to itself. This n draws the light body towards it until contact when the electric fluid of the excited body to the smaller one, so that its opposite electri- xpelled and it is in the same condition as its

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times sufficient to separate the electric fluids. Thus if two pieces of the same silk ribbon are rubbed together, lengthways, no electricity is produced, but if crossways, one is positively, and the other negatively, electrified. In this respect the analogy is evident to chemical affinity, which, in like manner, only acts between dissimilar bodies.

In order, however, to carry the proof of the identity of these forms of energy beyond the sphere of vague analogy, we must follow up electricity far beyond the simple manifestations of the glass rod and sealing-wax, and pursue it to its origin, in the transformations of chemical action and mechanical work, in the voltaic battery, the electric telegraph, the telephone, and the dynamo.

The voltaic battery, in its simplest form, is a trough containing an acid liquid in which pairs of plates of different metals are immersed. It is evident that if the action of the acid on each metal were precisely the same, equal quantities of each would be dissolved in the acid, and the equilibrium of chemical energies would not be affected. But, the action being different, this equilibrium is disturbed, and if the sum of these disturbances for a number of separate pairs of plates can be accumulated, it will become considerable. This is done by connecting the plates of the same metal in each cell by a metallic wire covered by some non-conducting substance. There are, therefore, two wires, one to the right hand, the other to the left, the loose extremities of which are called the poles of the battery. If we test these poles as we did the glass rod and stick of sealing-wax, we find that one pole is charged with positive and the other with negative electricity. In other words, the chemical

whose equilibrium was disturbed by the unequal f the acid on the plates of different metals, has nsformed into electrical energy manifesting it- t always does, under the condition of two equal osite polarities. If we connect these two poles e another the two electricities rush together te, and there is established what is called an l current circulating round the battery. As nical action of the acid on the metals is not ry but continuous, the acid taking up molecule lecule of the metal, so also the current is con- When we call it a current, the term is used ake of convenience, for as the current, as we shall y see, will flow along the wire or other con- substance for immense distances, as across the , with a velocity of many thousands of miles nd, we can, no more than in the case of light, to ourselves as an actual transfer of material

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when they are brought nearly together intense light is produced and the carbon slowly burns away. This produces what is called the arc light, which gives such a strong illuminating power and is coming into general use for lighting up large spaces.

Another transformation is back again into chemical energy, which is shown by the power of the electric current to decompose compound substances. If, for instance, the poles of a battery are plunged into a vessel containing water, the molecules of the water will be decomposed and bubbles of oxygen gas will rise from the positive, and of hydrogen from the negative, pole.

Another effect of electrical currents is that of attraction and repulsion on one another. If two parallel wires, free to move, carry currents flowing in the same direction as from positive to negative, or *vice versâ*, they will attract one another ; if in opposite directions, they will repel. Electrical currents also work by way of induction, that is, they disturb the electrical equilibrium of bodies brought within their influence and induce currents in them. Thus, if we have two circular coils of insulated wire placed near each other, one on the right hand, the other on the left, and connect the extremities of the right-hand coil with the poles of a battery, when the connection is first made and the current begins to flow, a momentary current in the opposite direction will pass through the left-hand coil. This will cease, and as long as the current continues to flow through the right-hand coil there will be no current through the other ; but if we break the contact between the right-hand coil and the battery, there will be again a momentary current through the left-hand coil, but this time in the same direction as the other.

e effect will be produced if, instead of making
king contact in the right-hand coil, we keep
nt constantly flowing through it, and make
-hand coil alternately approach and recede from
coil. In this case, when the right-hand coil
es, it induces an opposite current in the left-
; and when it recedes, one in the same direction
f the primary.

e phenomena of induction prepare us to under-
e nature of magnets, and the magnetic effects
by electrical currents. If an insulated wire is
round a cylinder of soft or unmagnetic iron,
rrent passed through the wire, the cylinder is
d into a magnet and becomes able to sustain
If the current ceases, the cylinder is no longer
, and drops the weight. A magnet is therefore
a substance in which electric currents are

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to the north and south, or rather to the magnetic poles of the earth, because its currents are influenced by the earth currents which circulate parallel to the magnetic equator. The deviation of the needle from this direction, caused by any other current, like that passed along the wire, will depend on the strength of the current, which may be measured by the amount of deflection of the needle. The direction in which the needle deflects, viz. whether the north pole swings to the right or to the left, will depend on the direction of the current through the wire. The direction of the circular currents which form a magnet is such that if you look towards the north pole of a freely suspended cylindrical magnet—i.e. if you stand on the north of it and look southwards—the positive current will ascend on your right hand, or on the west side, and descend on the east. It follows that unlike poles must necessarily attract, and like poles repel one another, for in the former case the circular currents which face each other are going in the same, and in the latter in opposite directions.

The reader is now in a position to understand the principle of the electric telegraph, that wonderful invention which has revolutionised human intercourse and, to a great extent, annihilated space and time. It originated in the discovery made by Oersted, a Danish *savant*, that the effect of an electric current was to make a magnet swing round, in the endeavour to place itself at right angles to it. The conducting power of insulated copper wire is such that it practically makes no difference whether one of the wires connected with the pole of a battery is two feet or 2,000 miles in length, and the earth, being a conducting medium, supplies an equal extension from the other pole, so that a closed

circuit may be established across the Atlantic as within the walls of a laboratory.

herefore, a magnetic needle is suspended at the n end, it will respond to every electrical current, any interruption, renewal, or reversal of that established in England. The needle may thus to swing to the right or left, by forming or g a current through the wire ; and it will return sition whenever the current is interrupted, and s movement whenever the current is renewed. t may be made to move like the arm of the old-d telegraph, or of a railway signal. It only to have a machine by which the operator can d interrupt currents rapidly, and a code by rtain movements of the needle stand for certain f the alphabet, and you have the electric tele-

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of nature available for his purposes by transforming them backwards and forwards, now into one, now into another form of energy, as required for the result he wishes to attain. He wants mechanical power to pump water or drive a locomotive or steamboat: he gets it from the steam-engine, by transforming the energy of heat in coal, which came ages ago from the energy of chemical action produced by the sun's rays in the green leaves of growing plants. He wants to send messages in a few seconds across the Atlantic: he does it by transforming chemical energy into electricity in a voltaic battery, sending its vibrations along a conducting wire, and converting it at the far end into mechanical power, making a magnetic needle turn on its axis and give signals. If, instead of sending a message, he wants to hold a conversation at a distance, he invents the telephone, by which sound-vibrations of air are transformed into vibrations of a disc, then into electric currents, then into vibrations of a distant disc, and finally back again to spoken words. Or, if he wants light, he turns electricity into it by tipping the poles of his battery with carbon and bringing them close together.

The latest inventions of electrical science—the dynamo and the accumulator—afford remarkable instances of this convertibility of one primitive energy into different forms. In the instance just quoted of obtaining light from electricity by the voltaic battery, the cost has hitherto proved an obstacle to its adoption. The electrical energy is all obtained from the transformation of the heat produced in the cells by the chemical action on the metal used, which is commonly zinc. Now, the heat of combination of zinc with oxygen is only about one-sixth of that of coal, while the cost of zinc is about

imes as great. Theoretically, therefore, energy urning zinc costs 120 times as much as that urning coal. Practically the difference is not great, for there is very little loss of energy in ry by the process of conversion, while the best gine cannot convert into work as much as er cent. of the heat energy in the coal consumed. er making every allowance, the cost of energy c remains some twenty times as great as from that unless some process is found for obtaining zinc as a residual product, there is no prospect form of electricity being generally available for for mechanical power.

dynamo is an instrument invented for the me- generation of electricity by taking advantage rinciple that electrical energy is produced by magnets near coils of wire, or coils of wire near A current is thus started by induction and

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on of cost and convenience, for you can only get elec·icity enough either to light a street or to drive an en-ine, by an original steam-engine or other motive power › work the dynamo, and a system of conducting wires › convey the electricity to the place where the light or ower is wanted. Where the motive power is supplied y nature, as in the case of tidal or river currents or ·aterfalls, it is quite possible that power may be ob-ıined in this way to compete with that obtained directly ·om the steam-engine; but there are as yet considerable ractical difficulties to be overcome in the transmission f any large amount of energy for long distances.

To overcome some of these difficulties the accu-nulator has been invented, which affords yet another ·emarkable instance of the transformation of energy. [t consists of two lead plates immersed in acidulated water. When a strong electrical current is sent through :he water, it decomposes it, the oxygen going to one .ead plate and the hydrogen to the other. The oxygen ıttacks the lead plate to which it goes, forming peroxide ›f lead; while the hydrogen reduces any oxide in the other ›late, producing pure lead, and leaving a film of surplus ıydrogen on the surface. The charging current is then ·eversed, so that the latter plate is now attacked and :he former one reduced, when the current is again re-versed. By continuing this process the surfaces of both ead plates become porous, so that they present a large surface, and can therefore hold a great deal of peroxide of ead. The charging current being now broken, the oxy-gen which has been forcibly separated from the liquid seeks to recombine with hydrogen; and if the two lead plates are joined by a wire, this effort of the oxygen generates an electrical current in the opposite direction

original one, which is the current utilised. ty is thus stored up in a portable box, where it kept till wanted, when it is drawn out by con- the plates, and as a large amount of energy accumulated the current which is produced a considerable time.

ortunately accumulators are bulky, heavy, and e, and nearly half the energy of the original current is lost in obtaining the reversed or current. They are therefore not as yet adapted ral use, though perfectly capable of supplying ght or motive power, for both which purposes ve been successfully applied in special cases. re both of electric power and electric lighting reduced entirely to a question of cost; and t is hard to beat gas and the steam-engine, with al, and air and water for nothing, it is possible sing natural sources of power to move dynamos

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CHAPTER V.

POLARITY IN MATTER.

nate elements of universe—Built up by polarity—Experiment with nagnet—Chemical affinity—Atomic poles—Alkalies and acids—Quanti-valence — Atomicity — Isomerism — Chemical stability — Thermo-hemistry—Definition of atoms—All matter built up by polar forces.

ALMOST fear that by this time some of my readers y think that I have seduced them under false pre-ices to read long chapters of dry science, when they d been led from the intro uction to anticipate discus-ns on the more immediately interesting topics of rals, religions, and philosophies. My excuse must that these scientific subjects are really of extreme erest in themselves and indispensable as a solid basis the superstructure to be raised on them. How can ttempt to show that the law of polarity extends to the re complex problems of human thought and life, if I l in establishing its application to the simpler case of rganic force and matter? It must be recollected also t among the primitive polarities is that of author and der. It is my part to endeavour to present the ding facts and laws of the material universe in such in and popular language that the ordinary reader o has neither time nor faculty for special studies may prehend them clearly without excessive effort, or ex-ordinary intelligence. But it is the reader's part to pply a fair average amount of attention, and above all

ın interest in interesting matters. Cleverness osity are very much convertible terms, and the exposition is thrown away on the torpid mind iews the marvellous universe in which he has ilege to live, with the stupid apathy of the aking things as they come without caring to ything about them.

the reader's part of the work I am not respon- ut for my own I am, and I proceed therefore to ny own way, and with the best faculty that is clear summary of such of the fundamental facts s of nature as seem necessary for the work I lertaken.

ı the preceding chapters we are now able to vhat are the ultimate elements of the material , and it remains to show how they are put to- The elements are ether, energy, and matter.

, ether: a universal, all-pervading medium,

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ıry matter with all its qualities, which are the ȝ used in building all the varied structures of the ic and inorganic worlds. Of these atoms some ty have never yet been divided, and therefore, ıgh we may suspect that they are merely combina- or transformations of one original matter, we must ntent for the present to consider them as elemen-

In like manner we may suspect that matter is in y only another form of energy, and that the im- ion of solidity is given by the action of a repellent which is very energetic at short distances. If this established we might look forward to the generali- a that energy was the one reality of nature ; but for present it is a mere speculation, and we must be ent with over seventy elementary atoms as ultimate . In any case this much is certain, that matter, energy, is indestructible. We have absolutely no rience of either of them being created or annihilated. more, we have no faculties to enable us even to eive how something can be made out of nothing, all we know, or can ever know, about these pri- re constituents of the universe is of their laws of ence, their evolutions and their transformations.

Iinute as the atoms and molecules are, we must eive of them not as stationary and indissolubly ected, but rather as little solar systems in which lving atoms form the molecule, and revolving cules form the matter, held together as separate ems by their proper energies and motions, until superior force intruding breaks up the system and its components free to form new combinations.

Vhat is the principle which thus forms, un-forms, re-forms the various combinations of atomic and

ar systems by which the world is built up from
tituent elements ? It is polarity.
I began with the illustration of the magnet
ing order and harmony into the confused mass
filings, let me take this other illustration from
e source. If we place an iron bar in contact
e pole of a magnet, the bar becomes itself a
with opposite poles to the original one, so that
site poles attract, the iron bar adheres to it.
lump of nickel in contact with the further end
pole of the iron bar, and the nickel also will
netised and adhere. Let the lump of nickel be
as the pole of the iron bar is able to support,
v bring a lump of soft iron near this pole. It
p the nickel and take the iron. This is exactly
to those cases of chemical affinity in which a
drops one of its factors and takes on another

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have but slight affinity for each other. Like therefore attracts unlike, as in all cases of polarity, and the greater the degree of unlikeness the stronger is the attraction. Thus, the radicals of all alkalies are electro-positive, and appear at the negative pole of a battery; while those of acids are all electro-negative, and the higher each stands in its respective scale of polarity the more strongly does it show the peculiar qualities of acid or alkali and the more eagerly does it combine with its opposite.

Acids and alkalies are, in fact, all members of the same class of compounds called *hydrates*, because a single atom of hydrogen is a common feature in their composition. This atom is coupled with a single atom of oxygen, which may be conceived of as the central magnet holding the hydrogen atom at one pole, while at the other it holds either a single atom of some metallic element, such as potassium or sodium, or a group consisting of such an element together with atoms of oxygen, so constituted as to present a single pole to the attraction of the central oxygen atom. Thus, if K stands for kali or potassium, N for nitrogen, O for oxygen, and H for hydrogen, we may have the compounds

$$\mathrm{H - O - K}$$

and

$$\mathrm{H - O - \left(N \begin{smallmatrix} \diagup\!\!O \\ \diagdown\!\!O \end{smallmatrix}\right)}.$$

The former is the molecule of potassic hydrate, which is the most caustic or strongest of alkalies; the latter, that of nitric acid, the most corrosive or powerful of acids. These are the extremes of the series, of which there are many intermediate members, all being more or

line, that is caustic and turning litmus-paper en the third element is a simple metallic atom; , corrosive, and turning litmus-paper red, when compound radical of a group of metallic and atoms. This shows to what an extent whole f substances may have a general resemblance in nstitution, and yet differ most widely in their by the substitution of one element for another. e special qualities may be made to diminish lly disappear by mixing the two opposite sub- or, as it is called, neutralising an acid by an r an alkali by an acid. Thus, if hydrochloric Cl, be poured into a solution of sodic-hydrate, – H, the alkaline qualities of the latter diminish lly disappear, the result of the neutral solution ater, H – O – H, and sodic-chloride, or com- t, Na – Cl. It is evident that this result has oduced by the hydrogen atom in H – Cl and

pole, as in the case of electricity in an excited glass rod, and have to create for themselves the opposite pole, which is the indispensable condition of all polarity, by induction in another body. Thus, muriatic or hydrochloric acid is formed by the union of a single atom of chlorine, which is strongly negative, with a single atom of hydrogen, in which it appears to have induced a positive pole: though the combination is not a very stable one, for if an element with a stronger positive pole of its own is presented to the chlorine, it drops the hydrogen, just as the magnet drops the nickel. Other atoms are multipolar, and seem as if made up of more than one magnet, or rather as if the atom had regular shape like a triangle, square, or pentagon, and each angle was a pole, thus enabling it to unite with three, four, five, or more atoms of other substances. Thus, one atom of nitrogen unites with three of hydrogen, one of carbon with four of hydrogen, and so on. Every substance has, therefore, what is called its 'quantivalence,' or power of uniting with it a greater or less quantity of other atoms, and conversely that of replacing in combinations other atoms, or groups of atoms, the sum of whose quantivalence equals its own. Thus, one atom of carbon, which has four poles, combines with four atoms of hydrogen or chlorine, which is unipolar, but with only two of oxygen, which are bipolar; while the oxygen atom combines with two of hydrogen, and that of chlorine with one atom only of hydrogen. The analogy between the single atomic and electrical poles on the one hand, and the dual and magnetic poles on the other, will be evident if we consider what occurs if a pith-ball, electrified positively, is brought near a similar ball electrified nega-

charge opposite to its own to
nearest conductor, and thus crea
second pole. Polarity, in fact,
relations, or two poles, and electi
magnetic polarity in the fact tha
poles are in the same body, while
in separate bodies.

For pith-balls read atoms, and
tion of the univalent atoms like t
sodium which act as single poles ;
by the fact that such atoms are nev
are always associated in a molecu
other atom which forms the oppos
cular system. Bivalent or magneti
hand, which have two poles, like th
zinc, may constitute a complete p
found isolated, and form the class
consist of single atoms.

This conception of the polarity c
understand the way in which the a
of substances existing in the worl

polarity. Thus, compounds may be built up of great and varied complexity, for the quality of any compound may be greatly altered by any one of the substitutions at any one of the poles. And the molecules, or small specimens of matter, may be thus built up into very complex aggregations of atoms, some single molecules containing more than a hundred atoms. Thus, carbon has four poles, or is quadrivalent, and its atoms possess the power of combining among themselves to an almost indefinite extent and forming groups of great stability. Thus, carbon radicals may be formed in very great number, each affording a nucleus upon which compound radicals may be built up, so that carbon has been aptly called the skeleton of almost all the varied compounds of the more complex forms of inorganic matter as well as the principal foundation of organic life.

Nor is this all, for the qualities of substances depend not only on the qualities of their constituent elements, but also on the manner in which these elements are grouped. Two substances may have exactly the same chemical composition and yet be very different. We may suppose that the same elements affect us differently according as they are grouped. Thus, the same bricks may be built up either into a cube or pyramid, which forms are extremely stable and can only be taken in pieces brick by brick; or into a Gothic arch, which all tumbles to pieces if a single brick forming the keystone is displaced. As an instance of this, butyric acid, which gives the offensive odour to rancid butter, has exactly the same composition as acetic ether, which gives the flavour to a ripe apple. They consist of the same number of atoms of the same elements

n, hydrogen, and oxygen—united in the same
ions. This applies to a number of substances,
called Isomerism, or formation of different
from the same parts.

principle of polarity, therefore, aided by the
ry conditions of quantivalence, atomicity, and
m, gives the clue to the construction of the inor-
orld out of some seventy elementary substances.
ubstances thus formed, whether of molecules or
inations of molecules, some are stable and some
. As a rule the simpler combinations are the
able, and instability increases with complexity.
e diamond, which is merely a crystal of pure
is very hard and indestructible; while dynamite,
-glycerine, which is a very complex compound,
s at a touch.

stability of a substance depends partly on the

[redacted]

burns, there is a falling back from a substance unstable, on account of its affinity for the oxygen in the air, into the stable products, carbonic dioxide and water, and the heat evolved is the effect of this fall.

As the tendency of all changes is towards stability we arrive at the following law, which is one of the most recent generalisations of modern chemistry: In all cases of chemical change the tendency is to those products whose formation will determine the greatest evolution of heat.

This, however, does not imply that the tendency may not be overcome and unstable products formed, for just as a weight may be lifted against the force of gravity, so may the chemical tendency be overcome by a sufficient energy acting against it. Heat is the principal means of supplying this energy, and by increasing it sufficiently not only are molecules drawn apart and most solids converted into fluids and finally into gases, but there is reason to believe that at extremely high temperatures, such as may prevail in the sun, all matter would be resolved into isolated or dissociated atoms. Thus, water at a temperature of 1,200° is resolved into a mixture of oxygen and hydrogen atoms no longer chemically united into water-molecules; and iodine-vapour, which below 700° degrees consists of molecules of two atoms, above that temperature consists of single atoms only.

The subject might be pursued further, but enough has been said for the present purpose to show that the universe consists of atoms which are endowed with polarity, and that as diminished temperature allows these atoms to come closer together and form compounds, matter in all its forms is built up by the action of polar forces.

CHAPTER VI.

POLARITY IN LIFE.

f living and dead—Eating and being eaten—Trace matter up- and life downwards—Colloids—Cells—Protoplasm—Monera— sition of protoplasm—Essential qualities of life—Nutrition and on—Motion—Reproduction—Spontaneous generation—Organic nds—Polar conditions of life.

ry having been established as the universal law inorganic world, we have now to pass to the or world of life. At first sight there seems to at gulf fixed between the living and the dead

[redacted]

each what may be called strictly individual amœbæ, forming separate units of the animated creation as much as the man and the bear. But if the two happen to come in contact, what happens? The two slimy masses involve one another and coalesce, and the resulting amœba swims away merrily as two gentlemen rolled into one.

Now in his case what became of their individualities: did amœba A eat amœba B, or *vice versa*, and is the resulting amœba a survival of A or of B, or of both or neither of them? And what becomes of the antithesis of 'eating or being eaten' which was so clear and distinct in the highly specialised forms of life, and is so evanescent in the simpler forms? This illustration may serve to teach us how necessary it is to trace things up to their origins, before expressing too trenchant and confident opinions as to their nature and relations.

In the case of the organic and inorganic worlds the proper course obviously is, not to draw conclusions from extreme and highly specialised instances, but to follow life downwards to its simplest and most primitive form, and matter upwards to the form which approaches most nearly to this form of life. Following matter upwards, we find a regular progression from the simple to the complex. Take the diamond, which is one of the simplest of substances, being merely the crystallised form of a single ultimate element, carbon. It is extremely hard and extremely stable. Ascending to compounds of two, three, or more elements, we get substances which are more complex and less stable; and at last we arrive at combinations which involve many elements and are extremely complex. Among these latter substances are some, called colloids, which

ıer solid, like crystals, nor fluid, like liquids, but
ermediate state, like jelly or the white of an egg,
ı the molecules have great mobility and are at
erable distance apart, so that water can pene-
eir mass. These colloids are for the most part
nplicated compounds of various elements based
cleus of carbon, which, from its atom having
es with strong mutual attractions, is eminently
for forming what may be called the inner
of these complex combinations. Colloids of
ription form the last stage of the ascending line
rganic matter to organic life.

t let us trace life downwards towards matter.
a constant succession from the more to the less
and differentiated: from man, through mammals,
fishes, and a long chain of more simple forms,
its end we come to the two last links, which
ame for all animals, all plants, and all forms of

[redacted]

w material out of which all the varied structures of e world of life are built up. Plants and animals, ›nes, muscles, and organs of sense, are all composed modified cells, hardened, flattened, or otherwise tered, as the case may require. If we trace life up its origin in the individual instead of in the species, e arrive at the same result. All plants and animals, hether of the lowest or highest forms, fish, reptile, rd, mammal, man, begin their individual existence as speck of protoplasm, passing into a nucleated cell, hich contains in it the whole principle of its subse- uent evolution into the mature and completed form.

Protoplasm is, therefore, evidently the nearest ap- roach of life to matter; and if life ever originated om atomic and molecular combinations, it was in this orm. To suppose that any more complex form of life, owever humble, could originate from chemical com- inations, would be a violation of the law of evolution, which shows a uniform development from the simple o the complex, and never a sudden jump passing at a ound over intermediate grades. To understand life, herefore, we must understand protoplasm; for proto- lasm, closely as it approximates to colloid matter, is horoughly alive. A whole family, the Monera, consist imply of a living globule of jelly, which has not even egun to be differentiated. Every molecule, as in a rystal, is of homogeneous chemical composition and an pitome of the whole mass. There are no special parts, no organs told off for particular functions, and yet all life-functions—nutrition, reproduction, sensation, and novement—are performed, but each by the whole body. The jelly-speck becomes a mouth to swallow, and urning inside out, a stomach to digest. It shoots out

of jelly to move and feel with, and presently
ws them.
h these attributes it is impossible to deny to
sm the full attributes of life, or to doubt that,
atom in the material world, it is the primary
of organic or living existence. Given the atom,
trace up, step by step, the whole evolution of
so given the protoplasm, we can trace up the
n of life by progressive stages to its highest
nent—man. To understand life, therefore, we
gin by trying to understand protoplasm.
t is protoplasm? In its substance it is a ni-
s carbon compound, differing only from other
compounds of the albuminous family of colloid
extremely complex composition of its atoms.
sts of five elements, and its average composition
by chemists to be 52·55 per cent. carbon, 21·23
15·17 nitrogen, 6·7 hydrogen, 1·2 sulphur. Its

[redacted]

protoplasm seems to differ only from a whole group of similar compounds of the type of glycerine, by the greater complexity and mobility of its molecules, it has developed the new and peculiar element which is called life. Life in its essence is manifested by the faculties of nutrition, sensation, movement, and reproduction.

As regards nutrition there is this essential difference between living and non-living matter. The latter, if it feeds and grows at all, does so only by taking on fresh molecules of its own substance on its outer surface, as in the case of a small nucleus-crystal of ice in freezing water. If it feeds on foreign matter and throughout its mass, it does so only in the way of chemical combination, forming a new product. Living matter, on the other hand, feeds internally, and works up foreign substances, by the process we call digestion, into molecules like its own, which it assimilates, rejecting as waste any surplus or foreign matter which it cannot incorporate. It thus grows and decays as assimilation or waste preponderates, remaining always itself. The distinction will be clear if we consider what happens when water rusts iron. In a certain sense the iron may be said to eat the oxygen, reject the hydrogen, and grow, or increase in weight by what it feeds on; but the result is not a bigger piece of iron, but a new substance, rust, or oxide of iron. That living matter should feed internally is not so wonderful, for its semi-fluid condition may well enable foreign molecules to penetrate its mass and come in contact with its own interior molecules; but it is an experience different from anything known in the inorganic world that it should be able to manufacture molecules of protoplasm like its own out of these foreign molecules, and thus grow by assimilation.

tance, when amœbæ, bacteria, and other low
ns live and multiply in chemical solutions
ontain no protoplasm, but only inorganic com-
containing the requisite atoms for making pro-
, or when a plant not only chemically decomposes
dioxide, exhaling the oxygen and depositing
on in its stem and leaves, but also from this
er elements drawn from the soil or air manu-
the living protoplasm which courses through
nels, the result is that life has manufactured life
on-living materials.

e take sensation, this, in its last analysis, is
or molecular motion, induced in a body by
n of its environment. Here there is a certain
between living and non-living matter, for the
oes respond to changes in the surrounding
nent, as in the case of heat, electricity, and

[redacted]

The case of sensation includes that of motion, which after all only sensation applied in the liberation of ıergy of position which has by some chemical process ecome stored up, either in the living mass, or in some pecial organ of it, such as muscle. Iron, for instance, ıoves when it expands by heat or is attracted by a ıagnet ; but it moves, like the planets, by fixed and alculable laws : while living matter moves, as might be xpected from the variable character of its sensation, in manner which often cannot be calculated. There are ases, however, of reflex or involuntary motion, where, ven in the highest living organisms, sensation and notion seem to follow change of environment, in a ixed and invariable sequence, as in shrinking from ain, touching or galvanising a nerve ; and it may be hat the apparent spontaneousness and variability of iving motion is only the result of the almost infinitely greater complexity and mobility of the elements of iving matter.

Reproduction remains, which is the faculty most haracteristic of life, and which distinguishes most sharply the organic from the inorganic world. In the norganic there is no known process by which dead natter reproduces itself, as the cell does when it contracts in the middle and splits up into two cells, which in their turn propagate an endless number of similar cells, increasing in geometrical progression until hey supply the raw material from which all the countess varieties of living organisms are built up, which, in heir turn, repeat the process and reproduce themselves n offspring. This is the real mystery of life ; we can artly see or suspect how its other faculties might arise from an extension of the known qualities and laws of

and of energy ; but we can discern no analogy
the non-reproductive nitrogenous carbon com-
which makes so near an approach to protoplasm
hemical composition, and the reproductive pro-
, which is fertile, increases and multiplies, and
hes the earth. Can the gap be bridged over:
toplasm be manufactured out of chemical ele-
It is done every day by plants which make
sm out of inorganic elements, and by the lowest
f life which live and multiply in chemical solu-
It is done also in the life-history of all indi-
whose primitive cell or ovum makes thousands
ons of other cells, each containing within its
g membrane as much protoplasm as there was
nit from which they started. But in all these
s there was the living principle to start with,
in the primitive speck of protoplasm, from

[redacted]

ppear in infusions contained in vessels which had een hermetically sealed, after being subjected to this, r even a higher degree of heat. But subsequent and nore careful experiments have shown that the germs r spores of bacteria and other animalculæ, which are generally floating in the air, can, when dry, withstand a greater degree of heat, and that when the experiments re made in optically pure air no life ever appears and the infusions never putrefy. On questions of this sort all who are not themselves expert experimentalists must be guided by authority, and we may be content to accept the dictum of Huxley that biogenesis, or all life from previous life, was 'victorious along the whole line.' But in doing so we must accept Huxley's caution, 'that with organic chemistry, molecular physics, and physiology yet in their infancy, and every day making prodigious strides, it would be the height of presumption for any man to say that the conditions under which matter assumes the qualities called vital, may not some day be artificially brought together.'

And further, 'that as a matter not of proof but of probability, if it were given me to look beyond the abyss of geologically recorded time, to the still more remote period when the earth was passing through chemical and physical conditions which it can never see again, I should expect to be a witness of the evolution of living protoplasms from non-living matter.' Such is the cautious candour with which scientific men approach problems upon which theologians dogmatise with the unerring intrepidity of ignorance.

In the meantime what may be said as to Huxley's reservations is this: A considerable step has been made in the direction indicated, by the success of recent

ry in forming artificially what are called or-
ompounds, that is, substances which were pre-
known only as products of animal or vegetable
ns. Urea, for instance, the base of uric acid, with
o many are unfortunately familiar in the form
; indigotine, the principle of the blue colouring
f the indigo plant ; and alizarine, that of madder;
ow produced artificially, and have even become
nt articles of commerce. If chemists can make
gotine, which the growing plant elaborates at
e time as it elaborates protoplasm, may we not
me day to make the latter as well as the former
? Now organic compounds of this class are
rmed artificially every day, and it is said that
s have already succeeded in producing several
s. But even if this expectation is never ful-
e may fall back on Huxley's second reservation

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: first protoplasm must be extremely ancient, for the nains of sea-weeds are found in the oldest strata, and getation of any sort implies the manufacture of proto-ısm from inorganic matter.

The passage from the organic into the inorganic orld is best traced by following the line of Pasteur's searches on ferments. How does the world escape ing choked up by the accumulation of dead organic atter throughout innumerable ages? By what are lled ferments, inducing processes of fermentation and itrefaction, by which the course of life is reversed, and ie organic elements are taken to pieces and restored to ie inorganic world. Pasteur proved, in opposition to the ieories of Liebig and other older chemists, that this was ot done directly by the oxygen of the air, but through ie intermediate agency of living microbes, whose spores, oating in the air, took up their abode and multiplied herever they found an appropriate habitation. Given a air purified from germs, or a temperature low enough) prevent them from germinating, and putrescible ibstances would keep sweet for ever. The practical alisation of this is seen in the enormous commerce in inned meats and fruits, and in the imports of frozen eef and mutton, causing a fall of rents and much mentation among British landlords and farmers.

But then the question was asked, How are your iicroscopic organisms disposed of? What are the rments of your ferments? For even microscopic acteria and vibrios would, in time, choke up the world y their residue if not got rid of. Pasteur answered that ie ferments are destroyed by a new series of organisms -aerobes—living in the air, and these by other aerobes a succession until the ultimate products are oxidised.

The life that has abandoned it is
other forms. In the superficial
air, the germs of the infinitely lit
multiply. The carbon, hydroge
organic matter are transformed b
and under the vital activity of th
acid, the vapour of water, and am
tion continues as long as organi
present together. At the same ti
bustion is going on, fermentation
performing their work in the m
means of the developed germs of
which, note, do not need oxygen
oxygen causes to perish. Gradual
destruction are at last accomplish
of latent fermentation and slow co

This seems a complete demonst
of the organic into the inorganic
analysis, or taking the puzzle to pi
way of synthesis, or putting it
approach yet made has been in the
organic compounds already ...

[redacted]

ɜr, on the one hand, that the problem has been solved that life has ever been made in a laboratory; or, he other hand, that there is any such great gulf fixed ᵹeen the organic and the inorganic, that we can me a break requiring secondary supernatural inter ıce to surmount it, and ignore the good old maxim 'Natura nihil facit per saltum.' Positive proof is ting, but the probabilities point here, as they do ywhere else throughout the universe, to the truth he theory of 'original impress' as opposed to that secondary interference.'

It remains to show how the fundamental law of ırity affects the more complex relations of life and ts various combinations. And here it is important ɔear in mind that as the factors of the problem be- ıe more intricate and complex, so also do the laws ch regulate their existence and action. Polarity is longer a simple question of attraction and repulsion he two ends of a magnet or at the opposite poles of atom. It appears rather as a general law under ch as the simple and absolute becomes differentiated evolution into the complex and manifold, it does so er the condition of developing contrasts. For every there is a *minus*, for every like an unlike; one can- exist without the other; and, although apparently ıgonistic, harmonious order is only possible by their ɜxistence and mutual balance.

This is so important that it may be well to make the clearer by an illustration. The earth revolves round sun in its annual orbit under the influence of two es: the centripetal, or force of gravity tending to w it towards the sun; and the centrifugal, tending to ɛe it dart away into infinite space. During half the

centripetal seems to be gaining ground on the
al, and the earth is approaching nearer to the
this continued it would revolve ever nearer and
into it; but the centrifugal force is gradually
its strength from the increased velocity of
until it first equals the centripetal, and finally
it, and for the remaining half of the orbit it is
y gaining ground. If this went on, the earth
off into the chilly regions of outer space;
entripetal force in its turn regains the ascen-
nd thus by the balance of the two forces our
escribes the beautiful ellipse, its harmonious
habitable globe; while comets in which one
er force unduly preponderates for long periods
ately drawn into fiery proximity to the sun,
careering through regions void of heat.

are this passage from Herbert Spencer: 'As

point at which it began, viz. the origin of life, we have to show how the law of polarity prevails in the organic as well as in the inorganic world. In the first place the material to which all life is attached, from the speck of protoplasm to the brain of man, is strictly a chemical product of atoms and molecules bound together by the same polar laws as those of inorganic matter.

In like manner all the essential processes by which life lives, moves, and has its being, are equally mechanical and chemical. If the brain, receiving a telegram from without through the optic nerve, sends a reply along another nerve which liberates energy stored up in a muscle and produces motion, the messages are received and transmitted like those sent by a voltaic battery along the wires of a telegraph, and the energy is stored up by the slow combustion of food in oxygen, just as that of the steam-engine is produced by the combustion of coal. All this is mechanical, inorganic, and therefore polar.

But when we come to the conditions of life proper, we find the influence of polarity mainly in this: that as it develops from simpler into more complex forms, it does so under the law of developing contrasts or opposite polarities, which are necessary complements of each other's existence. Thus, as we ascend in the scale of life, we find two primitive polarities developed: that of plant and animal, and that of male and female.

CHAPTER VII.

IMITIVE POLARITIES—PLANT AND ANIMAL.

n developed life—Plants producers, animals consumers—Differ- isappear in simple forms—Zoophytes—Protista—Nummulites— -Fungi—Lichens—Insectivorous plants—Geological succession ary period, Algæ and Ferns—Secondary period, Gymnosperms iary and recent, Angiosperms—Monocotyledons and Dicotyle- Parallel evolution of animal life—Primary, protista, mollusca, n—Secondary, reptiles—Tertiary and recent, mammals.

s or plants? Judging by first impressions, can be more distinct. No one, whether sci-

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s structure from the air, by breathing in through its aves the carbonic dioxide present in the atmosphere, ecomposing it, fixing the carbon in its roots, stem, id branches, and exhaling the oxygen. The animal xactly reverses the process, inhaling the oxygen of ie air, combining it with the carbon of its food, and xhaling carbonic dioxide. Thus, a complete polarity established, as we see in the aquarium, where plant id animal life balance each other, and the opposites ve and thrive, where the existence of either would be npossible without the other.

Sharp, however, as the contrast appears to be in ie more specialised and developed specimens of the vo worlds, we have here another instance of the diffi- ilty of trusting to first impressions, and have to odify our conceptions greatly, if we trace animal and egetable life up to their simplest forms and earliest igins. In the first place, each individual vegetable or nimal begins its existence from a simple piece of pure rotoplasm. This develops in the same way into a ucleated cell, by whose repeated subdivision the raw aterial is provided for both structures alike. The nief difference at this early stage is that the animal ells remain soft and naked, while those of vegetables ecrete a comparatively solid cell-wall, which makes iem less mobile and plastic. This gives greater gidity to the frame and tissues of the plant, and revents the development of the finer organs of sensa- on and other vital processes, which characterise the nimal. But this is a difference of development only, nd the origination of the future life from the speck of rotoplasm is the same in both worlds.

If, instead of looking at the origin of individuals, we

ck the various forms of animal and vegetable
n the more complex to the simpler forms, we
e distinctions between the two disappearing,
last we arrive at a vanishing point where it is
ble to say whether the organism is an animal or

whole family, comprising sponges, corals, and
h, are called Zoophytes, or plant-animals, from
iculty of assigning them to one kingdom or
er. On the whole they rather more resemble
and are generally classed with them, though
k many of their most essential qualities, and in
ten bear a close resemblance to plants. But
e descend a step lower in the scale of existence
e to a large family—the Protista—of which it is
ble to say that they are either plants or animals.
scientific observers have classed them sometimes

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Radiolaria, or many-chambered shells, forming the complicated and elegant mansion with many rooms and passages, of the formless, slimy mass which constitutes the living organism. Chalk also, and the chalk-like formation which is accumulating at the bottom of deep oceans, are the results of the long-continued fall of the microscopic snowdrift of shells of the Globigenera and other protistic forms swimming in the sea; and in a higher stage of development the skeletons of corals, one of the family of Zoophytes or plant-animals, form the coral reefs and islands so numerous in the Pacific and Indian Oceans, and are the basis of the vast masses of coralline limestone deposited in the coal era and other past geological periods.

As development proceeds the distinction between plants and animals becomes more apparent, though even here the simplest and earliest forms often show signs of a common origin by interchanging some of the fundamental attributes of the two kingdoms. Thus, the essential condition of plant existence is to live on inorganic food, which they manufacture into protoplasm, by working up simple combinations into others more complicated. Their diet consists of water, carbonic dioxide, and ammonia; they take in carbonic dioxide and give out oxygen, while animals do exactly the reverse. But the fungi live, like animals, upon organic food consisting of complicated combinations of carbon, which they assimilate; and, like animals, they inhale oxygen and give out carbonic dioxide.

Lichens afford a very curious instance of the association of vegetable and animal functions in the same plant. They are really formed of two distinct organisms: a body which is a low form of Alga or sea-weed,

arasitic form of fungus, which lives upon it. ner has a plant life, living on inorganic matter ning the green cells, or chlorophyll, which are ntial property of plants, enabling them under the f the sun's rays to decompose carbonic dioxide; e parasite lives like an animal on the formed sm of the parent stem, forming threads of ss cells which env lop and interlace with the lichen of which they constitute the principal in a tree overgrown with ivy.

n in existing and highly developed plants we e curious instances of reversion towards animal rtain plants, for instance, like the Dionæa or fly-trap, finding it difficult to obtain the re-upply of nitrogenous food in a fluid state from or marshy soil in which they grow, have a habit of supplying the deficiency by taking

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and it is only when they happen to have secreted shells or skeletons that we have a chance of identifying them. Still we have a sufficient number of remains in the different geological strata to enable us to trace development. Thus, in the vegetable world, in the earliest strata, the Laurentian, Cambrian, and Silurian, forming the primordial period, which forms a thickness of some 70,000 feet of the earth's crust—or more than that of the whole of the subsequent strata, Primary, Secondary, Tertiary, and Quaternary, taken together—we find only vegetable remains of the lowest group of plants, that of the Tangles or Algæ, which live in water. Forests of these sea-weeds, like those of the Aleutian Islands, in some of which single tangles stream to the length of sixty feet, and floating masses, like those of the Sargasso Sea, appear to have constituted the sole vegetation of these primæval periods.

The Primary epoch, which comes next, comprises the Devonian or Old Red Sandstone, the Carboniferous or Coal system, and the Permian, the average thickness of the three together amounting to about 42,000 feet. In these the family of Ferns predominates, the remains of which constitute the bulk of the large strata of coal, forming in modern times our great resource for obtaining the energy which, in a transformed shape, does so much of our work. Pines begin to appear, though sparingly, in this epoch.

The Secondary epoch comprises the Triassic, the Jurassic, and the Cretaceous or Chalk formation, the average thickness of the three amounting to about 15,000 feet. In this era a higher species of vegetation predominates, that of the Gymnosperms, or plants having naked seeds, of which the pines, or Coniferæ, and the

rns, or Cycadeæ, are the two principal classes. the case of the former epoch, traces of the hing higher organisation in the form of leaf- trees began to appear towards its close.

Tertiary period extends from the end of the Chalk commencement of the Quaternary or modern It is divided into the Eocene or older, the Mio- middle, and the Pliocene or newest Tertiary ; though the division is somewhat arbitrary, de- on the number of existing species, mostly of shell- ich have been found in each. The average thick- the three together is about 3,000 feet. In this on a still higher class of vegetation of the same s that now existing, which made its first appear- the Chalk period, has become predominant. It of Angiosperms, or plants with covered seeds, leafy forests of true trees. This group is

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time of the more complex and perfect from the simple and primitive.

If we turn to the same geological record to trace the development of animal life, we find it running a parallel course with that of plants. The earliest known fossil, the Eozoon Canadiense, from the Lower Laurentian, is that of the chambered shell of a protista of the class of Rhizopods, whose soft body consists of mere protoplasm which has not yet differentiated into cells. As we ascend the scale of the primordial era, traces of marine life of the lower organisms begin to appear, until in the Silurian they become very abundant, consisting however mainly of mollusca and crustacea, and in the Upper Silurian we find the first traces of fishes.

In the Primary era the Devonian and Permian formations are characterised by a great abundance of fishes, of the antique type, which has no true bony skeleton, but is clothed in an armour of enamelled scales, and whose tail, instead of being bi-lobed or forked, has one lobe only—a type of which the sturgeon and gar-pike are the nearest surviving representatives. In the Coal formation are found the first remains of land animals in the form of insects and a scorpion, and a few traces of vertebrate amphibious animals and reptiles; while higher up in the Permian are found a few more highly developed reptiles, some of which approximate to the existing crocodile. Still fishes greatly predominate, so that the whole Primary period may be called the age of fishes, as truly as, looking at its flora, it may be called the age of ferns.

In the Secondary period reptiles predominate, and are developed into a great variety of strange and colossal forms. The first birds appear, being obviously

d from some of the forms of flying lizards, and
many reptilian characters. Mammals also put in
eble appearance, in the form of small, marsupial,
rous creatures.

he Tertiary period the class of mammals greatly
nates over all other vertebrate animals, and
see the principal types slowly developing and
iating into those at present existing. The
type appears plainly in the middle Miocene, in
of a large anthropoid ape, the Dryopithecus,
doubted human remains are found in the
g of the Quaternary, if not, as many distin-
geologists believe, in the Pliocene and even in
ene ages.

far, therefore, there seems to be a complete
sm between the evolution of animal and
e life from the earliest to the latest, and from

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sation of animal life. Plants, on the other hand, could not exist without a supply of the carbonic dioxide, which is their principal food, and which animals are continually pouring into the air from the combustion of their carbonised food in oxygen, which supplies them with heat and energy. Thus nature is one huge aquarium, in which animal and vegetable life balance each other by their contrasted and supplemental action, and, as in the inorganic world, harmonious existence becomes possible by this due balance of opposing factors.

CHAPTER VIII.

IMITIVE POLARITIES—POLARITY OF SEX.

eration—Base of ancient cosmogonies—Propagation non-sexual ler forms—Amœba and cells—Germs and buds—Anemones—
—Spores—Origin of sex—Ovary and male organ—Hermaphro- Parthenogenesis—Bees and insects—Man and woman—Cha- of each sex—Woman's position—Improved by civilisation— nity the feminine pole—Monogamy the law of nature—Tone ng women test of character—Women in literature—In —Attraction and repulsion of sexes—Like attracts unlike— arriage—Woman's rights and modern legislation.

nd female created He them.' At first sight

world, is only a later edition, revised according to monotheistic ideas, of the far older Chaldean legend which describes the creation of Cosmos out of Chaos by the co-operation of great gods, male and female. Even in later and more advanced religions, traces of this ineradicable tendency to assume difference of sex as the indispensable condition of the creation of new existence are found to linger and crop up in cases where they are altogether inapplicable. Thus, in the orthodox Christian creed we are taught to repeat 'begotten, not made,' a phrase which is absolute nonsense, or *non-sense*—that is, an instance of using words like counterfeit notes, which have no solid value of an idea behind them. For 'begotten' is a very definite term, which implies the conjunction of two opposite sexes to produce a new individual. Unless two deities are assumed of different sexes the statement has no possible meaning. It is a curious instance of atavism, or the way in which the qualities and ideas of remote ancestors sometimes crop up in their posterity.

Science, however, makes sad havoc with this impression of sexual generation being the original and only mode of reproduction, and the microscope and dissecting knife of the naturalist introduce us to new and altogether unsuspected worlds of life. By far the larger proportion of living forms, in number at any rate, if not in size, have come into existence without the aid of sexual propagation. When we begin at the beginning, or with those Monera which are simple specks of homogeneous protoplasm, we find them multiplying by self-division. Amœba A, when it outgrows its natural size, contracts in the middle and splits into two Amœbæ, B and C, which are exactly like one another and like

inal A. In fact B contains one half of its
A, and C the other half. They each grow to
of the original A, and then repeat the process of
and duplicating themselves.
next earliest stage in the evolution of living
the nucleated cell, does exactly the same thing.
cleus splits into two, each of which becomes a
leus for the protoplasmic matter of the original
either multiply within it, or burst the old cell-
become two new cells resembling the first.
next stage in advance is that of propagation by
buds, in which the organism does not divide
equal parts, but a small portion of it swells
s surface, and finally parts company and starts
parate existence which grows to the size of
ent by its inherent faculty of manufacturing
toplasm from surrounding inorganic materials.

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fterwards multiply by division until they form a many-elled organism, which has the hereditary qualities of he original one. This is the general form of propagaion of the lower plants, such as algæ, mosses, and erns, and also of a number of the lower forms of nimal-like microscopic organisms, such as bacteria, whose spores, floating in the air in enormous quantiies, and multiplying when they find a fit soil with astonishing rapidity, in a few days devastate the potato crop of a whole district or bring about an epidemic of scarlet-fever or cholera. They have their use however in creation, and their action is beneficent as well as the reverse, for they are the principal cause of putrefaction, the process by which the dead organic matter, which, if not removed, would choke up the world, is resolved into the inorganic elements from which it sprang, and rendered available for fresh combinations.

We are now at the threshold of that system of sexual propagation which has become the rule in all the higher families of animals and in many plants. It may be conceived as originating in the amalgamation of some germ-cell or spore with the original cell which was about to develop into a germ-bud within the body of some individual, and by the union of the two producing a new and more vigorous originating cell which modified the course of development of the germ-bud and of its resulting organism. This organism, having advantages in the struggle for life, established itself permanently with ever new developments in the same direction, which would be fixed and extended in its descendants by heredity, and special organs developed to meet the altered conditions. Thus at length the distinction would be firmly established of a female organ or ovary containing

or primitive cell from which the new being
e developed, and a male organ supplying the
g spore or cell, which was necessary to start
in the evolutionary process by which it de-
nto the germ of an offspring combining quali-
he two parents. This is confirmed by a study
yology, which shows that in the human and
nimal species the distinction of sex is not
d until a considerable progress has been made
rowth of the embryo. It is only however in
er and more specialised families that we find
e of propagation by two distinct individuals of
sexes firmly established. In the great major-
nts, and in some of the lower families of animals
tance, snails and earth-worms—the male and
gans are developed within the same being, and
what is called hermaphrodites. Thus, in most

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he universal rule, and it produces a polarity or contrast vhich becomes ever more conspicuous as we rise in the scale of creation, until it attains its highest development n the highest stage hitherto reached, that of civilised nan and woman. Both physical and mental character-stics depend mainly on the fact that the ovary or egg-producing organ is developed in the female, and thus the whole work of reproduction is thrown on her. To perform this a large portion of the vital energy is required, which in the male is available for larger and more prolonged growth of organs, such as the brain, stature, and limbs, by which a more powerful grasp is attained of the outward environment. In other words, the female comes sooner to maturity and is weaker than the male. She is also animated by a much stronger love for the offspring, which is part of her own body, during the period of infancy; and thus, in addition to the physical attributes, such as lacteal glands and larger breasts, she inherits qualities of softness, amiability, and devotion, which fit her for the office of nurse. Her physical weakness, again, has made her, for untold ages, and even now in all the less advanced communities, and too often even in the most advanced, the slave of the stronger male. She has thus inherited many of the mental qualities which are essential to such a state: the desire to propitiate by pleasing and making herself attractive; the gentleness and submissiveness which shrink from a contest of brute force in which she is sure to be defeated; the clinging to a stronger nature for support, which in extreme cases leads to blind admiration of power and the spaniel-like attachment to a master whether deserving of it or not. As civilisation however advances, and as intellectual and moral

gain ascendency over brute strength and ani-
ncts, the condition of woman improves, and it
ore and more to be recognised that she is not
be man's slave or plaything, but has her own
ty and character, which, if in some respects
are in others better than those of the male
reation. Tennyson, the great poet of modern
who sums up so many of the ideas and tenden-
e age in concise and vigorous verse, writes :—

> For woman is not undeveloped man,
> Nor yet man's opposite.

osite, yet different, so that the one supple-
hat is wanting to the other, and the harmonious
f the two makes ideal perfection. It is the
European civilisation to have done so much
p this idea of the equality of the sexes, and to
e so far towards emancipating the weaker half

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rule to live as the sparrows do, taking no thought for the morrow, the verdict of *fact* is in favour of foresight and frugality. Herbert Spencer has stated this polarity very strongly as that of the religion of amity and the religion of enmity ; but I think he states the case too adversely for the latter, for the qualities which make men and nations good fighters and victorious in the struggle for existence, are in their way just as essential as the gentler virtues, and both alike become defects when pushed to the 'falsehood of extremes.' Christianity, therefore, whatever may become of its dogmas, ought always to be regarded with affection and respect for the humanising effect it has produced, especially in improving the condition of the female half of creation.

This improvement in the condition of women has brought about a corresponding improvement in the male sex, for the polarity between the two has come to be the most intimate and far-reaching influence of modern life. Take the literature of the novel and play, which aim at holding up the mirror to human nature and contemporary manners, and you will find that they nearly all turn upon love. The word 'immorality' has come to signify the one particular breach of the laws of morality which arises from the relations of the sexes.

In providing for the birth of nearly equal numbers of each sex, nature clearly establishes monogamy, or union of single pairs, as the condition of things most in accordance with natural laws. The family also, the first germ of civilisation, is impossible, or can only exist in a very imperfect and half-developed state, without this permanent union of a single husband and wife. Violations of this law lead to such disastrous

ences to individuals, and are so deteriorating to that they are properly considered as the 'im-' *par excellence*, and condemned by all right- opinion. And yet to observe this law is a lesson in self-control for a great part of the lesson of the utmost value, for it is a virtue s at the root of all other virtues. And it is nd becomes habitual and easy by practice, for the muscles of the ballet-dancer's leg or black- arm acquire strength and elasticity by use, so ner fibres of the brain improve by exercise and soft and flabby by disuse, so that effort in the ase is a pleasure and in the latter a pain. For son chaste nations are generally strong and ng nations; dissolute Imperial Rome went efore the Goths and Germans, and polygamous perishes of dry rot in the midst of the progress ineteenth century. Indeed there is no better

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Nothing in fact gives one more hope in the progress of human society than to find that in the freest countries, and those farthest advanced towards modern ideas and democratic institutions, the tone with regard to women shows the greatest improvement. There is a regular *crescendo* scale of progress from Turkey to America. I do not refer so much to the fact that in the newer colonies and countries women can travel unprotected without fear of insult or injury, as to the almost instinctive recognition of their equal rights as intelligent and moral beings who have a personality and character of their own, which places them on the same platform as men though on opposite sides of it.

To understand rightly the real spirit of an age or country, it is not enough to study dry statistics or history in the form of records of wars and political changes. We must study the works of the best poets, novelists, and dramatists, who seek to embody types and to hold up the mirror to contemporary ideas and manners. A careful perusal of such works as those of Dickens, Thackeray, Trollope, and George Eliot at home, and of Bret Harte, Howells, James, and Mrs. Burnett in the United States, will give a truer insight into the inner life of the country and period than any number of blue-books or consular returns. They show what the writers of the greatest genius, that is, of the greatest insight, see as types of the actual ideas and characters surrounding them; and the fact of their works being popular shows that the types are recognised as true. Now it is certain that the English literature of fiction and its latest development, that of the American novelists, show an ever-increasing recognition of the female individual as an equal unit with the male in the constitution

ern society. Those dear ' school marms ' of Bret
and Wendell Holmes', who career so joyously
ı mining camps, receiving courtesy and radia-
ilising influences among the rough inhabitants;
h the hearts and throw a mellow light over
umn days of middle-aged professors and philo-
, are far removed from the slaves of prehis-
vages or the inmates of a Turkish harem. So
the more complex relations of a more crowded
ion, in the circles of Washington, New York, and
the ideal American woman is always depicted
it, intelligent, and independent, with a character
rsonality of her own, and the suspicion never
o enter the author's head that she is in any
inferior to the male characters with whom she is
ed.

same may be said to a great extent of English
e from the time of Shakespeare downwards.

brother Tom. Compare these characters with those of the school of modern French novels, which turn mainly on adultery and seduction, committed for the most part not in any whirlwind of irresistible passion, but to gratify some passing caprice or vanity, and it is easy to see how wide is the gulf which separates the ideals and moral atmosphere of the two countries.

It is not therefore from any wish to indulge in what Herbert Spencer calls the 'unpatriotic bias,' and depreciate my own country, that I am disposed to think that the younger English-speaking communities are somewhat in advance of ourselves in this matter of the relations of the sexes, but simply because I think that the feeling is there more widespread and universal. We have in English society two strata in which women are still considered as inferior beings to men: a lower one, where better ideas have not yet permeated the dense mass of ignorance and brutality; and a higher one, where among a certain portion, let us hope a small one, of the gilded youth and upper ten, luxury and idleness have blunted the finer susceptibilities, and created what may be most aptly called a Turkish tone about women. There are many of this class, and unfortunately often in high places, where their example does widespread mischief, whose ideal might be summed up in the words of the Irish ballad:—

> I am one of the ould sort of Bradies,
> My turn does not lie to hard work;
> But I'm fond of my pipe and the ladies,
> And I'd make a most illigant Turk.

And most 'illigant Turks' they make, though far worse than real Turks who are born and brought up in the ideas and surroundings of a lower civilisation; while

of our English Turks is far more nauseous and ng, as denoting innate selfishness, sensuality, garity. Of these two classes there seem to be the newer English communities ; and if they ey are in such a small minority that they con- ir existence, and pay the homage of vice to hich is called hypocrisy.

eturn, however, to the more scientific aspects of stion, the polarity of sex displays itself as con- ly as that of the magnet in the fundamental epulsion of like for like, and attraction of like ke. In each case there must be an identity of developing itself in opposite directions. Thus, ttract or repel atoms, but not molecules ; for if m to do so, it is only in cases in which the contains some atom whose atomicity or polar as not been fully satisfied. So currents of air do not affect electric currents. But given the

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in the happy marriage or perfect ideal union, the qualities which are most deficient in themselves : the woman, strength, active courage, and the harder qualities; the man, gentleness, amiability, and the softer virtues. In each individual, as in each union of individuals, harmony and perfection depend on the due balance of the opposite qualities, and the 'falsehood of extremes' leads up to chaos and insanity. The man in whom strength and hardihood are not tempered by gentleness and affection becomes brutal and tyrannical ; while the woman who has no strength of character becomes silly and frivolous. Marriage, however, involves the highest ideal, for the well-assorted union of the two in one gives a more complete harmony and reconciliation of opposites than can be attained by the single individual, who must always remain more or less within the sphere of the polarity of his or her respective sex. But here also the same law of polarity operates, for as happy marriage affords the highest ideal, so do unhappy and ill-assorted unions involve the greatest misery and most complete shipwreck of life. Especially to the woman, for the man has other pursuits and occupations, and can to a great extent withdraw himself from domestic troubles ; while the woman has no defence against the coarseness, selfishness, and vulgarity of the partner to whom she is tied, and who may make her life a perpetual purgatory, and drag all her finer intellectual and moral nature down to a lower level. Fortunately extreme cases are rare, and, though the ideal of a perfect union may seldom be attained to, the great majority of married couples manage to jog on together, and bring up families in comparative comfort and respectability. Evidently, however, in many cases the weaker party

t get fair play, and the laws which are the f centuries of male legislation are often too s of the maxim that what is 'sauce for goose is r gander.' Improvement, however, is coming e growth of the more healthy public opinion igmatises any invasion of woman's real rights, attempt on the part of her natural protector and tyrannise, as utterly disgraceful ; and the f this public opinion are slowly but surely the cliffs of legal conservatism, and forcing the ments of stolid injustice behind ermine robes. r wigs, and obsolete Acts of Parliament.

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CHAPTER IX.

PRIMITIVE POLARITIES—HEREDITY AND VARIATION.

Heredity in simple forms of life—In more complex organisms—Pangenesis—Varieties how produced—Fixed by law of survival of the fittest—Dr. Temple's view—Examples: triton, axolotl—Variations in individuals and species—Lizards into birds—Ringed snakes—Echidna.

As the earth is kept in an orbit, which makes life possible by the balance of the antagonist centripetal and centrifugal forces, so is that life evolved and maintained by the balance of the two conflicting forces of heredity and variation. Heredity, or the principle which makes offsprings resemble their parental organisms, may be considered as the centripetal force which gives stability to species; while variation is like the centrifugal force which tends to make them develop into new forms, and prevents organic matter from remaining ever consolidated into one uniform mass.

As regards heredity, the considerations which have been advanced in the last chapter, on the origin of sex, will enable the reader to understand the principles on which it is based. When a moneron, or living piece of pure protoplasm, or its successor the nucleated cell, propagates itself by simple division into two equal parts, it is obvious that each half must, in its atomic constitution and motions, exactly resemble the original. If amœba A divides into amœbæ B and C, both B and C

t facsimiles of A and of one another, and so are
eny of B and C through any number of gener-
They must remain identical repetitions of the
orm, unless some of them should happen to
fied by different actions of their surrounding
nent, powerful enough to affect the original
tion.

ropagation by germs or buds, the same thing
ld true, only, as the offspring carries with it
half, but only a small portion of the parental
, its impress will be less powerful, and the
anism will more readily be affected by external
es. When we come to propagation by spores or
lls, and still more to sexual propagation by the
f single cells of two progenitors, it becomes
icult to see how the type of the two parents, and
line of preceding ancestors, can be maintained

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ɜnt. In breeding animals, it is not uncommon to l the peculiar features of generations of ancestors g since extinct cropping up occasionally in indi-uals. Thus, stripes like those of the ass along the k and down the shoulders, occasionally appear on ·ses whose immediate ancestors for many generations ·k showed nothing of the sort; and even stripes oss the legs like those of the zebra occur quite ɜxpectedly, and testify to the common descent of the ·ious species of the horse tribe from a striped an-tor. How these ancestral peculiarities can be trans-;ted through many generations, each individual of ich originated from a single microscopic cell which l been fructified by another cell, is one of the great· mysteries of nature. It may assist us in forming ne idea of the possibility of a solution to remem-· what has been proved as to the dimensions of ·ms. Their order of magnitude is that of a cricket-l to the earth. In a single microscopic cell, there-e, there may be myriads of such atoms circling round ɜ another and forming infinitesimal solar systems, of ınite complexity and variety. Darwin's theory of ɜngenesis' supposes that some of the actual identical ·ms which formed part of ancestral bodies are thus nsmitted through their descendants for generation ɜr generation, so that we are literally 'flesh of the h' of the primæval creature who was developed ɔ man in the later tertiary or early glacial period. eckel, more plausibly, suggests that not the identical ms, but their peculiar motions and mode of aggre-ion have been thus transmitted: a mode of trans-ısion which, with his prevailing tendency to invent g and learned names for everything, he calls the

nesis of plastids.' In any case, however, these
e taken not as solutions of the problem, but as
at the truth which show that its solution is
ossible.

opposite principle to heredity, that of variation,
ly important and universal. It is apparent in
that although every individual of every species
ces qualities of parents and ancestors, no two
als do so in precisely the same manner ; no two
tly alike. This difference, or individuality, be-
nore marked as the organism is higher. Thus,
nd hounds differ from one another by slight
ces which require the practised eye of the shep-
huntsman to detect ; while human beings are
e, that of the many millions existing in each
on no two exactly resemble one another. The
f this is apparent if we consider that the higher

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action of the opposing forces of variation and heredity, by which latter the variations appearing in individuals are fixed and accumulated in descendants, until they become wide and permanent divergencies. This is done in the case of cultivated plants and domestic animals by man's artificial selection in pairing individuals who show the same variations; and in nature by the struggle for existence, giving victory and survival to those forms, and in the long run to those forms only, whose variations, slight as they may be in each generation, tend to bring individuals into better adaptation to their environment.

It is the great glory of Darwin to have established this firmly by an immense number of interesting and exhaustive instances, and thus placed evolution, or a scientific explanation of the development and laws of life, on a solid basis. Every day fresh discoveries and experiments confirm this great principle, and it has almost passed into the same phase as Newton's law of gravity, as a fundamental law accepted as axiomatic by all men of science, and as the basis of modern thought, to which all religions and philosophies have to conform, accepted by nearly all modern thinkers. I may here quote a passage from an eminent Anglican divine, Dr. Temple, for the double purpose of showing how universal has become the acceptance of this Darwinian view of evolution among intelligent men; and how little terrible are its consequences, even to those who look at the facts of the universe through a theological medium and retain their belief in accepted creeds.

'It seems in itself something more majestic, more befitting of Him to whom a thousand years are as one day, and one day as a thousand years, thus to impress His will once for all on this creation, and provide for

untless varieties by this one original impress,
special acts of creation to be perpetually modi-
at He had previously made.' [1]

tific men would be content to accept this state-
Dr. Temple's almost in his own words, except
might consider his definition of the Great First
somewhat too absolute and confident. Having
deal so much with actual facts and accurate
ge, they are apt to be more modest in asser-
even the most enlightened theologian, whose
ave lain rather in the direction of phrases and
hich, from their very nature, are more vague
finite, and perhaps rather guesses and aspira-
r truth, than proofs of it. In any case there
thority of a learned and liberal-minded bishop
osition that the scientific way of looking at the
is not necessarily profane or irreligious.

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If they are shut up in water and kept in a tank ıever lose their gills, but continue through life in ›wer stage of development, and reproduce them- in other tritons with gills. Conversely the tl, a peculiar gilled salamander from the Lake of :o, has its normal course to live, die, and propa- ts species in water, breathing by gills; but if an tl happens to stray from the water and take to on dry land, the gills are modified into lungs and nimal gains a place in the class in the school of ›pment. This fits in remarkably with the fact he embryo of all vertebrate mammals, including passes through the gilled stage before arriving at evelopment of lungs, which assists us in under- ing two facts of primary importance in the history ›lution.

irst, how terrestrial life may have arisen from ic life by adaptation to altered conditions.

condly, how the evolution of the embryo sums up individual, in the period of a few days or months, arious stages of evolutions which it has taken mil- of years to accomplish in the species.

s a parallel to the transformation of gills into , and of an aquatic into a land animal, if we turn e geological records of the Secondary period we trace the transformation of a water into an air ation, of sea-lizards into flying-lizards, and of fly- zards into birds. The 'Hesperornis' is an actual nen of the transition, being a feathered lizard, ther winged and feathered creature which is half and half bird.

remarkable instance of the great change of func- which may be produced by a change of outward

ditions is afforded by the common ringed sn
ich in its natural state lays eggs which take tl
eks to hatch; but if confined in a cage in which
d is strewed it hatches the eggs within its own bo
l from oviparous becomes viviparous. This r
p us to understand how the lowest order of m
ls, which, like the Australian echidna or duck-bi
le, lay eggs, may have developed, first into marsup
l finally into placental mammals.

These examples may assist the reader in understa
how the infinite diversities of living species r
e been developed in the course of evolution fr
ple origins, just as the inorganic world was fr
ms, by the action and reaction of primitive po
es between the organism and its environment,
ween heredity and variation.

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CHAPTER X.

THE KNOWABLE AND UNKNOWABLE—BRAIN AND THOUGHT.

Basis of knowledge—Perception—Constitution of brain—White and grey matter—Average size and weight of brains—European, negro, and ape—Mechanism of perception—Sensory and motor nerves—Separate areas of brain—Sensory and motor centres—Abnormal states of brain—Hypnotism—Somnambulism—Trance—Thought-reading—Spiritualism—Reflex action—Ideas how formed—Number and space—Creation unknowable—Conceptions based on perceptions—Metaphysics—Descartes, Kant, Berkeley—Anthropomorphism—Laws of nature.

BEFORE entering on the higher subjects of religions and philosophies, it is well to arrive at some precise idea of the limits of human knowledge, and of the boundary line which separates the knowable from the unknowable. The ultimate basis of all knowledge is perception. Without an environment to create impressions, and an organ to receive them, we should know absolutely nothing. What is the environment and what the organ of human knowledge? The environment is the whole surrounding universe, or, in the last analysis, the motions, or changes of motion, by which the objects in that universe make impressions on the recipient organ. The organ is the grey matter of that large nervous agglomeration, the brain. But here I must at the outset make two reservations. In the first place I do not define how these impressions are made. In all ordinary

ey are made through the channels of the senses; possible that in certain exceptional cases vibra- the brain, causing perceptions, may be conveyed rough the nerves in other ways. In somnam- for instance, it seems to be an ascertained fact omnambulist with closed eyes securely bandaged k in the dark and avoid obstacles as well as if by the sight in full daylight. There is a great deal nce also that in artificial somnambulism, other- lled mesmerism or hypnotism, and also in what thought-reading, perceptions may be conveyed e brain to another otherwise than by the usual of speech or writing. But these phenomena, far they may be extended, do not affect the that impressions on the brain are the essential n of thought. If the grey matter of the brain ent or diseased the mind is affected, and beyond

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dary of such knowledge as really can be known by human faculty, and stand face to face with the mystery of the Great Unknown, we can only bow our heads with reverence and say with the poet,

> Behold, I know not anything.

I hope thus to steer safely between Scylla and Charybdis—between the arid rocks of materialism and the whirling eddies of spiritualism. Materialist and spiritualist seem to me very like two men disputing as to the existence of life in the sun. 'No,' argues the former; 'for the known conditions there are totally inconsistent with any life we can conceive.' 'Yes,' says the other; 'for the belief fits in with many things which I earnestly wish to believe respecting a Supreme Being and a future existence.' To the first I say, ignorance is not evidence; to the second, wishes are not proofs. For myself, while not quarrelling with those more favoured mortals who have, or fancy they have, superior knowledge, I can only say that I really know nothing; and this being the case, I see no use in saying that I know, and think it both more truthful and more modest to confess the limitation of my faculties.

With this caution I return to the field of positive knowledge. The brain, spinal marrow, and nerves consist of two substances: one white, which constitutes the great mass consisting of tubes or fibres; the other grey, which is an aggregation of minute cells, so minute that it has been computed that there are several millions of them in a space no larger than a sixpence. The bulk of this grey nerve-tissue is found in the higher animals, and especially in man, in the outside rind which covers the brain, and its amount is greatly increased by the convo-

lutions of that organ giving a greater extent of cc
surface. In fact the convolutions of the average
brain give as much grey matter in a head of ε
size, as would be given by a head of four times t
if the brain were a plane surface. The extent
convolutions is, therefore, a sure sign of the ex
intellect. They are more numerous and deeper
European than in the negro; in the negro than
chimpanzee; in the anthropoid ape than in the n
or lemur. This grey nerve-tissue is the organ by
impressions from without are turned into perce
volitions, and evolutions of nerve force. The
matter is simply the medium of transmission,
may say the telegraph wires by which the impr
are conveyed to the head office and the answe
The cell-tissue of the grey matter is thus emph
the organ of the mind. In fact, if it did not sou

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indispensable for the existence of intellect; the more there is of it as the brain increases in size and the convolutions become deeper, the greater is the intellect; when these fall below certain dimensions intellect is extinguished and we have idiocy. The average brain of the male white European weighs $49\frac{1}{2}$ ounces, of the negro a little under 47. The maximum brains which have been accurately weighed and measured, are those of Cuvier and Daniel Webster, the weight of the former being $64\frac{1}{8}$ ounces, and the capacity of the latter being 122 cubic inches; while the average capacity of the Teutonic race, including English, Germans, and Americans, is 92 inches, of the negro 83, and of the Australian and Hottentot 75. The brain of the idiot seldom weighs over 23 ounces, and the minimum weight consistent with a fair degree of intelligence is about 34 ounces.

The mechanism by which correspondence is kept up between the living individual and the surrounding universe is very simple—in reality, as simple as that of any ordinary electric circuit. In the most complex case, that of man, there are a number of nerve-endings, or small lumps of protoplasm, embedded in the tissues all over the body, or highly specialised and grouped together in separate organs such as the eye and ear, from which a nerve-fibre leads direct to the brain, or to the spinal cord and so up to the brain. These nerve-endings receive the different vibrations by which outward energy presents itself, which propagate a current or succession of vibrations of nerve-energy along the nerve-fibre. This nerve-fibre is a round thread of protoplasm covered by a white sheath of fatty matter which insulates it like the wire of a submarine telegraph

with gutta-percha. This nerve-wire leads up to
'e-centre, consisting of two corpuscles of proto-
: the first or sensory, a smaller one, which is
ted by branches with the second, a much larger
lled the motor, from which a much larger nerve-
or wire proceeds, which terminates in a mass of
lasm firmly attached to a muscle. Thus, a sen-
is propagated along the sensory nerve to the
y nerve-centre, whence it is transmitted to the
-centre, which acts as an accumulator of stored-up
, a large flow of which is sent through the large
ctor of the motor-nerve to the muscle, which it
to contract and thus produces motion. It is
hat the simpler involuntary actions are produced
rocess which is purely mechanical. In the more
ex cases, in which consciousness and will are
ed, the process is essentially the same, though
complicated. The message is transmitted to the

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mometer, and so on. And the same for the motor-centres and nerves. One set is told off to move the muscles of the face, another those of the arms, others for the legs and body, and so forth. This is further complicated by the fact that the brain like the rest of the body has two sides, a right and left, and that in some cases the motor-apparatus is doubled, each working only on one side, while in others the same battery and wires serve for both. As a rule the right hemisphere of the brain works the muscles of the left side of the body, and *vice versâ*, so that an injury to one side of the brain may paralyse the voluntary motion of the limbs on the opposite side, leaving in a perfect condition those on its own side.

In the case of the higher functions involving thought, the upper part of the brain, which performs these functions, seems to be a sort of duplex machine, so that we have two brains capable of thinking, just as we have two eyes capable of seeing. It is a remarkable fact that the areas of the brain which are appropriated to the lowest and most instinctive functions, which appear first, lie lowest, and as the functions rise the position of their nerve-centres rises with them. Thus, at the very base of the frontal convolutions at the lowest end of the fissure of Rolando, we find the motor areas for the lower part of the face, by which the lowest animals and the new-born infant perform their solitary function of sucking and swallowing. Higher up are the centres in the right and left brains for moving the upper limbs, that is, for seizing food and conveying it to the mouth, which is the next function in the ascending scale. Next above these are the centres for moving the lower limbs and for co-ordinating the motions of the

and hind ends of the envelo
come the organs of the intelle

It is easy to see that this
gression of the individual, for
for food from the first day,
hand and grasp objects, but ta
walk, and still longer to perfo
or riding, in which the moti
have to be co-ordinated with t
as the development of the indi
the evolution of life from pr
suppose that the brain was deve
its first origin in a swelling at
cord as we find it in the lowest

It is a singular fact that the
which gives the faculty of arti
small patch of about one and
the left side of the lower portio
this is injured, the disease called
which the patient loses the pow
by connected words. The corr
right side cannot talk : but in

[redacted]

ıainly by a great number of sensory nerve-centres or ells, connected with one another in a very complicated etwork. These seem to be connected with the multiıde of ideas which are excited in the brain by pereptions derived from the higher senses, especially that f sight. The simple movements are produced by a ew large motor-centres, which have only one idea and lo only one thing, whether it be to move the leg or the ırm. But a sensation from sight often calls up a multude of ideas. Suppose you see the face of one with vhom some fifty years ago you may have had some outhful love passages, but your lives drifted apart, and ou now meet for the first time after these long years, ıow many ideas will crowd on the mind, how many ıerve-cells will be set vibrating, and how many nerveurrents set coursing along intricate paths! No wonder hat the nerve-corpuscles are numerous and minute, ınd the nerve-channels many and complicated.

When we come to the seats of the intellectual aculties the question becomes still more obscure. They are probably situated in the hinder and front parts of the surface of the brain, and depend on the grey matter consisting of an immense number of minute sensory cells. It has been computed that there are millions in the area of a square inch, and they are all in a state of the most delicate equilibrium, vibrating with the slightest breath of nervous impression. They depend for their activity entirely on the sensory perceptive centres, for there is no consciousness in the absence of sensory stimulation, as in dreamless sleep. Perception, however caused, whether by outward stimulation of real objects, or by former perceptions revived by memory, sends a stream of energy through the sense-area, which

s, like a river divided into numerous channels, ng the intellectual area, where it is stored up nory, giving us the idea of continual individual ce, and by some mysterious and unknown pro-coming transformed into consciousness and de-thought. And conversely the process is re-when what we call will is excited, and the small s of the intellectual area are concentrated by an f attention and sent along the proper nerve-s to the motor-centres, whose function it is to the desired movement. This mechanical ex-on, it will be observed, leaves entirely untouched stion of the real essence and origin of these in-al faculties, as to which we know nothing more e do of the real essence and origin of life, of and of energy.

very curious light however is thrown on them

'e, as in dreams, with such wonderful vividness and uracy that the somnambulist in acting the dream s things altogether impossible in the waking state. us an ignorant Scotch servant-maid is said to have ited half a chapter of the Hebrew version of the Old stament: the explanation being that she had been the service of a Scotch minister, who was studying brew, and who used to walk about his room reciting s identical passage. It would seem as if the brain re like a very delicate photograph plate, which takes urate impressions of all perceptions, whether we ice them or not, and stores them up ready to be roduced whenever stronger impressions are dormant l memory by some strange caprice breathes on the te.

Most wonderful, however, are some of the pheno- na of trance. In this case it really seems as if) distinct individuals might inhabit the same body. nes falls into a trance and dreams that he is Smith. nile the trance lasts he acts and talks as Smith, really is Smith, and even addresses his former self nes as a stranger. When he wakes from the trance has no recollection of it, and takes up the thread of own life, just as if he had dozed for a minute instead being in a trance for hours. But if he falls into a ond trance, days or weeks afterwards, he takes up trance life exactly where he dropped it, absolutely getting his intermediate real life. And so he may on alternating between two lives, with two separate sonalities and consciousnesses, being to all intents l purposes now Jones and now Smith. If he died ing a trance, which would he be, Jones or Smith? e question is more easily asked than answered; but it

y appears as if with one mode of motion in the
rain you might have one mind and personal
associated with it, and with another mode of
different ones.

vould take me too far, and the facts are too
l, to investigate the large class of cases included
he terms thought-reading, telepathy, psychism,
ritualism. It may suffice to say that there is a
al of evidence for the reality of very curious
ena, but none of any real weight for their being
by any spiritualistic or supernatural agency.
l seem to resolve themselves into the assertion
der special conditions the perceptions of one
an be reproduced in another otherwise than by
inary medium of the senses, and that in such
ns a special sort of cataleptic energy or psychic
y be developed. The amount of negative evi-

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It is pretty certain that although the brain greatly preponderates as an organ of mind in man and the higher animals, the grey tissue in the spinal marrow and nervous ganglia exercises a limited amount of the same functions proportionate to its smaller quantity. The reflex or automatic actions, such as breathing, are carried on without reference to the brain, and the messages are received and transmitted through the local offices without going to the head office. This is the case with many complicated motions which originated in the brain, but have become habitual and automatic, as in walking, where thought and conscious effort only intervene when something unusual occurs which requires a reference to the head office; and in the still more complex case of the piano-player, who fingers difficult passages correctly while thinking of something else or even talking to a bystander.

Indeed, in extreme cases, where experiments on the brain have been tried on lower animals, it is found that it can be entirely removed without destroying life, or affecting many of the actions which require perception and volition. Thus, when the brain has been entirely removed from a pigeon, it smoothes its feathers with its bill when they have been ruffled, and places its head under its wing when it sleeps; and a frog under the same conditions, if held by one foot endeavours to draw it away, and if unsuccessful, places the other foot against an obstacle in order to get more purchase in the effort to liberate itself.

So much for the organ of mind; the other factor, that of outward stimulus, is still more obvious. If thought cannot exist without grey nerve-tissue, neither can it without impressions to stimulate that tissue. A

brain, if cut off from all communication with
ernal universe, could no more think and have
ons, than impressions from without could gene-
n without the appropriate nerve-tissue. Once
d, the mind can store them up by memory, con-
m by reason, and gradually evolve from them
her and higher ideas and trains of reasoning,
the individual and the species :—in the indi-
passing from infancy to manhood, partly by
from ancestors, and partly by education—using
d in the large sense of influences of all sorts
surrounding environment ; in the species, by a
but much slower development from savagery to
on.

s the whole fabric of arithmetic, algebra, and the
alculi are built up from the primitive perception
ber. The earliest palæolithic savage must have

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eption that two apples or two bears were different
ı one.

[n like manner geometry, as its name indicates,
ːs from primitive perceptions of space, applied to the
tical necessity of land-measuring in alluvial valleys
those of the Nile and Euphrates, where annual
ıdations obliterated to a great extent the dividing
ı between adjoining properties. The first percep-
ɜ of space would take the form of the rectangle, or so
y feet or paces, or cubits or arm-lengths, forwards,
so many sideways, to give the proper area; but as
s were irregular, it would be discovered that the
ıgle was necessary for more accurate measurement.
ce the science of the triangle, circle, and other
ılar forms, as we see it developed in Euclid and
r treatises on geometry, until we see it in its latest
ːlopment in speculations as to space of four dimen-
s.

But in all these cases we see the same funda-
tal principle as prevails throughout the universe
er the name of the 'conservation of energy'; always
ething out of something, never something out of
ıing.

This, therefore, defines the limit of human know-
ːe, or boundary line between the knowable and the
nowable. Whatever is *transformation* according to
ting laws is, whether known or unknown, at any
, knowable—whatever is *creation* is unknowable.
have absolutely no faculties to enable us to form
remotest conception of what the essence of these
ıary atoms and energies really is, how they came
ːe, and how the laws, or invariable sequences, under
ch they act, came to be impressed on them. We

o faculties, because we have never had any
ions upon which the mind can work. Reason
gination can no more work without antecedent
ions than a bird can fly in a vacuum.

ıs, for instance, the imagination can invent
s, centaurs, and any number of fabulous mon-
y piecing together fragments of perceptions in
mbinations; but ask it to invent a monster
head shall be that of an inhabitant of Saturn
s body that of a denizen of Jupiter, and
is it? Of necessity all attempts to define or
e things of which we have never had percep-
must be made in terms of things of which
e had perceptions, or, in other words, must be
omorphic.

far as science gives any positive knowledge as
elations of mind to matter, it amounts to this:

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All attempts to further fathom the depths of the known follow a different line, that of metaphysics, in other words, introspection of mind by mind, and leavour to explain thought by thinking. On enter- into this region we at once find that the solid earth ;iving way under our feet, and that we are attempting fly in an extremely rare atmosphere, if, indeed, we not idly flapping our wings in an absolute vacuum. tead of ascertained facts which all recognise, and)eriments which conducted under the same conditions 'ays give the same results, we have a dissolving view :heories and intuitions, accepted by some, denied by ers, and changing with the changing conditions of age, and with individual varieties of characters, otions, and wishes. Thus, mind and soul are with ne philosophers identical, with others mind is a duct of soul; with some soul is a subtle essence, h others absolutely immaterial; with some it has an ividual, with others a universal, existence; by some s limited to man, by others conceded to the lower mals; by some located in the brain, by others in heart, blood, pineal gland, or dura mater; with ne it is pre-existent and immortal, with others ited specially for its own individual organism; and on *ad infinitum*. The greatest philosophers come stly to the conclusion that we really know nothing ut it. Thus Descartes, after having built up an orate metaphysical theory as to a spiritual, indi- ble substance independent of the brain and cogni- e by self-consciousness alone, ends by honestly fessing 'that by natural reason we can make many jectures about the soul, and have flattering hopes, no assurance.' Kant also, greatest of metaphysicians

lishing the fallacies of former theories, when he
o define his 'noumenon,' has to use the vaguest
ses, such as 'an indescribable something, safely
out of space and time, as such not subject to
abilities of those phenomenal spheres, . . . and
se ontological existence we are made aware by
nomenal projections, or effects in consciousness.'
ntence takes our breath away, and makes us
hise with Bishop Berkeley when he says, 'We
ysicians have first raised a dust, and then
n we cannot see.' It prepares us also for
final admission that nothing can really be proved
aphysics concerning the attributes, or even the
ce, of the soul; though, on the other hand, as it
be disproved, its reality may for moral purposes
med.

ppears, therefore, that the efforts of the sublimest

[redacted]

how I am I, whether I was I before I was born, or shall be so after I am dead, I really know no more than the little dog who wags his tail and yelps for joy when he recognises my personal identity as something distinct from his own, when he sees me coming up the walk.

Our conceptions, therefore, are necessarily based on our perceptions, and are what is called anthropomorphic. The term has almost come to be one of reproach, because it has so often been applied to religious conceptions of a Deity with human, though often not very humane, attributes; but, if considered rightly, it is an inevitable necessity of any attempt to define such a being or beings. We can only conceive of such as of a magnified man, indefinitely magnified no doubt, but still with a will, intelligence, and faculties corresponding to our own. The whole supernatural or miraculous theory of the universe rests on the supposition that its phenomena are, in a great many cases, brought about, not by uniform law, but by the intervention of some Power, which, by the exercise of will guided by intelligent design, alters the course of events and brings about special effects. As long as the theory is confined to knowable transformations of existing things, like those which are seen to be affected by human will, it is not necessarily inconceivable or irrational. Inferring like effects from like causes, the hypothesis was by no means unreasonable that thunder and lightning, for instance, were caused by some angry invisible power in the clouds. On the contrary, the first savage who drew the deduction was a natural philosopher who reasoned quite justly from his assumed premises. Whether the premises were true or not was a question which could only

rmined centuries later by the advance of accurate dge.

en do we say we know a thing? Not when we ts essence and primary origin, for of these the philosopher is as ignorant as the rudest savage; en we know its place in the universe, its relation r things, and can fit it in to that harmonious e of events which is summed up in what are Laws of Nature. The highest knowledge is when trace it up to its earliest origin from existing and energy, and follow it downwards so as to to predict its results. The force of gravity a good illustration of this knowledge, both where s up to, and where it falls short of, perfection.

ton's law leaves nothing to be desired as re- s universal application and power of prediction; do not yet fully understand its mode of action

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existing savages, that if the collection in the Colonial Exhibition of stone celts and arrow-heads used by the Bushmen of South Africa were placed side by side with one from the British Museum of similar objects from Kent's Cavern or the caves of the Dordogne, no one but an expert could distinguish between them, the conclusion is inevitable that Devonshire and Southern France were inhabited at some remote period by a race of men not more advanced than the Bushmen. Any theory of man's origin and evolution which is to hold water must take account of this fact and square with it. And so of a vast variety of facts which have been reduced to law and become certainly known during the last half-century. A great deal of ground remains unexplored or only partially explored; but sufficient has been discovered to enable us to say that what we know we know thoroughly, and that certain leading facts and principles undoubtedly prevail throughout the knowable universe, including not only that which is known, but that which is as yet partially or wholly unknown. For instance, the law of gravity, the conservation of energy, the indestructibility of matter, and the law of evolution, or development from the simple to the complex.

CHAPTER XI.

RELIGIONS AND PHILOSOPHIES

'working hypotheses'—Newman's illative sense—Origins of
s—Ghosts and spirits—Fetishes—Nature-worship—Solar
—Planets—Evolution of nature-worship—Polytheism, pan-
and theism—Evolution of monotheism in the Old Testament
ution of morality—Natural law and miracle—Evidence for
s—Insufficiency of evidence—Absence of intelligent design—
icism—Origin of evil—Can only be explained by polarity—
sm and pessimism—Jesus, the Christian Ormuzd—Christianity
miracles.

thus, I may hope. given the reader some pre-
s of what are the boundaries and conditions of

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iown to fail. To this some distinguished advocates ' Catholic theology replied, that their conviction was a higher nature, for their belief in God was a final uth which was the basis of their whole intellectual .d moral nature, and which it was irrational to ques-)n. This is in effect Cardinal Newman's celebrated gument of an 'illative sense,' based on a complete sent of all the faculties, and which was therefore higher authority than any conclusions of science. ıe answer is obvious, that complete assent, so far)m being a test of truth, is, on the contrary, almost ways a proof that truth has not been attained, owing her to erroneous assumptions as to the premises, or the omission of important factors in the solution of e problem. To give an instance, I suppose there uld not be a stronger case of complete assent than at of the Inquisitors who condemned the theories of ılileo. They had in support of the proposition that e sun revolved round the earth the testimony of the ıses, the universal belief of mankind in all ages, the rect statement of inspired Scripture, the authority of e infallible Church. Was all this to be set aside cause some 'sophist vainly mad with dubious lore' ld them, on grounds of some new-fangled so-called ience, that the earth revolved round its axis and und the sun? 'No; let us stamp out a heresy so con- ary to our "illative sense," and so fatal to all the most rtain and cherished beliefs of the Christian world, the inspiration of the Word of God, and to the ıthority of His Church.' 'E pur si muove,' and yet .e earth really did move; and the verdict of *fact* was ıat Galileo and science were right, and the Church and ıe illative sense wrong.

ruth the distinction between the conclusions of and those of religious creeds might be more y expressed by saying that the former are ıg hypotheses' which never fail, while the re 'working hypotheses' which frequently fail. he fundamental hypothesis of Cardinal Newman school of a one infinite and eternal personal vho regulates the course of events by frequent ous interpositions, so far from being a necessary omatic truth, has never appeared so to the im- majority of the human race: and even at the day, in civilised and so-called Christian coun- s principal advocates complain that ninety-nine very hundred practically ignore it. It is not so e uniformity of the laws of nature. No palæo- ıvage ever hesitated about putting one foot after in chase of a mammoth from a fear that his

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presentatives of our early progenitors ; and secondly ; historical records. In the first case we find the ear- est rudiments of religious ideas in the universal belief ı ghosts and spirits. Every man is conceived of as eing a double of himself, and as having a sort of hadowy self, which comes and goes in sleep or trance, nd finally takes leave of the body, at death, to con- inue its existence as a ghost. The air is thus peopled vith an immense number of ghosts who continue very nuch their ordinary existence, haunt their accustomed bodes, and retain their living powers and attributes, vhich are exerted generally with a malevolent desire to njure and annoy. Hence among savage races, and by urvival even among primitive nations of the present day, ve find the most curious devices to cheat or frighten way the ghost, so that he may not return to the house in vhich he died. Thus, the corpse is carried out, not by he door, but by a hole made for the purpose in the wall, vhich is afterwards built up, a custom which prevails vith a number of widely separated races—Greenlanders, Hottentots, Algonquins, and Fijians ; and the practice ven survives among more civilised nations, such as the Chinese, Siamese, and Thibetans ; nor is it wholly xtinct in some of the primitive parts of Europe.

This idea obviously led to the practice of construct- ng tents or houses for the ghosts to live in, and of de- ositing with them articles of food and weapons to be sed in their ghostly existence. In the case of great hiefs, not only their arms and ornaments are deposited, out their horses, slaves, and wives were sacrificed and ouried with them, so that they might enter spirit-land vith an appropriate retinue. The early Egyptian tombs were as nearly as possible facsimiles of the house in

he deceased had lived, with pictures of his geese,
nd other possessions painted on the walls, evi-
under the idea that the ghosts of these objects
minister to the wants and please the fancy of the
ghost whose eternal dwelling was in the tomb
is mummy was deposited.

other development of the belief in spirits is that
-worship, in which superstitious reverence is
some stock or stone, tree or animal, in which a
ous influence is supposed to reside, probably
o its being the chosen abode of some powerful
This is common among the negro races, and
a curious development among many races of
an Indians, where the tribe is distinguished by
em, or badge of some particular animal, such as
, the tortoise, or the hare, which is in some way
d to be the patron spirit of the clan, and often

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By far the earliest traces of anything resembling eligious ideas are those found in burying-places of the ieolithic period. It is evident that at this remote eriod ideas prevailed respecting ghost or spirit life ind a future existence very similar to those of modern avages. They placed weapons and implements in the graves of the dead, and not infrequently sacrificed human victims, and held cannibal feasts. Whether this was lone in the far more remote palæolithic era is uncertain, for very few undoubted burials of this period have been liscovered, and those few have frequently been used again for later interments. We can only draw a negative inference from the absence of idols which are so abundant in the prehistoric abodes explored by Professor Schliemann, among the very numerous carvings and lrawings found in the caves of the reindeer period in France and Germany, that the religion of the palæoithic men, if they had any, had not reached the stage when spirits or deities were represented by images.

For the first traces therefore of anything like what is now understood by the term religion, we must look beyond the vague superstitions of savages, at the historical records of civilised nations. As civilisation advanced population multiplied, and rude tribes of hunters were amalgamated into agricultural communities and powerful empires, in which a leisured and cultured class arose, to whom the old superstitions were no longer sufficient. They had to enlarge their 'working hypothesis' from the worship of stocks and stones and fear of ghosts, to take in a multitude of new facts and ideas, and specially those relating to natural phenomena which had roused their curiosity, or become important to them as matters of practical utility. The establish-

f an hereditary caste of priests accelerated this
on of religious ideas, and from time to time re-
its progress. The oldest of such records are
f Egypt and Chaldæa, where the fertility of
valleys watered by great rivers had led to the
development of a high civilisation. The re-
lso of the Chinese, Hindoos, Persians, and other
take us a long way back towards the origins of
s.

all cases we find them identical with the first
of science, and taking the form of attempted
tions of natural phenomena, by the theory of
objects and powers of nature. In the Vedas
this in the simplest form, where the gods are
personifications of the heavens, earth, sun, moon,
nd so forth; and where we should say the red
f morning announces the rising of the sun, they

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s the primitive mode of expressing the same idea that which is expressed in Genesis by saying that l created the firmament separating the heaven above n the earth beneath ; Assur and Kesar mean the ne thing as the hosts of heaven and the earth ; the l Bel is the sun, and so forth. It is evident that the t attempts to explain the phenomena of nature ori-ated in the idea that motion and power implied life, sonality, and conscious will ; and therefore that the th, sky, sun, moon, and other grand and striking nomena, must be regarded as separate gods.

As culture advanced astronomy became more and re prominent in these early religions, and solar myths ame a principal part of their mythologies, while rology, or the influence of planets and stars on man affairs, became an important part of practical . The Chaldæan legend referred to contains a mass astronomical knowledge, which in the Genesis edition reduced to 'He made the stars also.' It describes w the constellations were assigned their forms and nes, the twelve signs of the zodiac established, the ır divided into twelve months, the equinoxes de-mined, and the seasons set their bounds. Also how moon was made to regulate the months by its disc, orns shining forth to lighten the heavens, which on seventh day approaches a circle.'

In the still older Egyptian pyramids we find proof the long previous existence of great astronomical owledge and refined methods of observation, for these ldings, which are at once the largest and the oldest the world, are laid down so exactly in a meridian e, and with such a close approximation to the true itude, as would have otherwise been impossible. In

re is every reason to believe that while they
nstructed as tombs for kings, they were at the
me intended for national observatories, for the
ment of the internal passages as such is to make
eat Pyramid serve the purpose of a telescope,
ially mounted, and showing the transits of stars
nets over the meridian, by reference to a reflected
f what was then the polar star, a knowledge of
vas essential for accurate calculation of the cal-
nd seasons, for fixing the proper date of religious
nies, and very probably for astrological purposes.
prevalence of these solar and astronomical
among a number of different nations separated
intervals of space and time is very remarkable.
ans, Indians, Babylonians, Chinese, Mexicans,
ruvians had myths which were strangely simi-
eed almost identical, based on the sun's annual

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marked by five stars, setting in the north-west. Anyhow, this myth of an infant god born of a virgin mother holds a prominent place in the religions of Egypt, India, China, Chaldæa, Greece, Rome, Siam, Mexico, Peru, and other nations. The resemblances are often so close that the first Jesuit missionaries to China found that their account of the miraculous conception of Christ had been anticipated by that of Fuh-ke, born 3468 B.C.; and if an ancient priest of Thebes or Heliopolis could be restored to life and taken to the Gallery of Dresden, he would see in Raffaelle's Madonna di San Sisto what he would consider to be an admirable representation of Horus in the arms of Isis.

The planets also, still more mysterious in their movements than the sun, and therefore still more endowed with human-like faculties of life, power, and purpose, were from an early period believed to exercise an influence on human affairs. Of the universality of this belief we find traces in the names of the days of the week, which are so generally taken from the sun, moon, and five visible planets—Mercury, Mars, Jupiter, Venus, and Saturn—to whom special days were dedicated. If every seventh day is a day of rest, it was originally so because it was thought unlucky to undertake any work on the Sabbath, Saturday, or day of the gloomy and malignant Saturn.

As time rolled on and civilisation advanced, this simple nature-worship and deification of astronomical phenomena developed into larger and more complex conceptions. Following different lines of evolution, polytheism, pantheism and monotheism began to emerge as religious systems with definite creeds, rituals, and sacred books. These lines seem to have been determined

deal by the genius of the race in which the re-
development took place. The impressions made
human mind by the surrounding universe are
arious. Suppose ourselves looking up at the
s on a clear starry night, what will be the
ion? To one, that of awe and reverence, and
feel crushed, as it were, into nothingness, in the
e of such a sublime manifestation of majesty and
Another, of more æsthetic nature, will be charmed
beauty of the spectacle, and tempted to assign
t, and to personify and dramatise its incidents.
, of a scientific turn, will above all things wish
rstand it.

is we find the impression of awe preponderating
the Semitic races generally; and as in their
l relations, so in their religious conceptions, we
em prone to prostrate themselves before despotic

[redacted]

feeling of the unity of nature forcing itself on the more philosophical minds; partly from that feeling of reverence and awe in presence of the Unknown which swallowed up other conceptions; and partly, in the earlier stages, from the feeling which exalted the local god of the tribe or nation, first into a supremacy over other gods, and finally into sole supremacy, degrading all other gods into the category of dumb idols made by human hands. In the Old Testament we can trace the development of this latter idea in its successive stages. Until the later days of the Jewish monarchy it is evident that the Jews never doubted the existence of other gods; and their allegiance oscillated between Jehovah and the heathen deities symbolised by the golden calf, worshipped in high places, and contending for the mastership in the rival sacrifices of Elijah and the priests of Baal. But the prophetic element gradually introduced higher ideas, and in the reigns of Hezekiah and Josiah the worship of Jehovah as the sole God became the religion of the State; and old legends and documents were re-edited in this sense in the sacred book, which was discovered and published for the first time in the reign of the latter king. The subsequent misfortunes of the nation, their captivity and contact with other religions in Babylonia, strengthened this monotheism into an ardent, passionate national faith, as it has continued to be with this remarkable people up to the present day. Christianity and Mahometanism, children of Judaism, have spread this form of faith over a great part of the civilised world; and of the three theories of polytheism, pantheism, and monotheism, it may be said that only the two latter survive.

Polytheism was bound to perish first, for slow as

ance of science was, the uniformity of most of
nomena, which had been attributed to so many
gods, could not fail to make an impression;
ideas of morality came slowly and tardily to
ved as an element of religion, the cruel rites
ndalous fables which so generally accompanied
istic religions became shocking to an awakening
ice.

worthy of remark that this element of morality,
has now gone so far towards swallowing up the
was the latest to appear. Even in the Jewish
ion Jehovah was for a long time just as often
ealous, and capricious, as just and merciful; and
l's doctrine that because God had the power to
le liked, He was warranted in creating a large
of the human race as 'vessels of wrath,' pre-
l to eternal punishment, is as revolting to the

ase that of awe, reverence, and abject submission in resence of an almighty power—is allowed to run its ourse without check and obtain undue preponderance.

Apart from these extreme instances we may say hat the two religious theories which have survived to he present day in the struggle for existence, are monoheism and pantheism. Pantheism is, in the main, the reed of half the human race—of the teeming millions of ndia, China, Japan, Ceylon, Thibet, Siam, and Burmah. Iow deeply it is rooted in their conceptions was very orcibly impressed on me in a conversation I had on oard one of the P. and O. steamers with an English missionary returning from China. He told me how he ad dined one evening with an intelligent Chinese merhant, and after dinner they walked in the garden iscussing religious subjects, and he tried to impress on is host the first principles of the Christian religion. t was a starlight night, and for sole reply the Chinese entleman stretched his hand to the heavens and said, Do you mean to tell me all that is dead—do you take ie for a fool?' The Chinese 'illative sense' was as bsolute in its conclusions for pantheism, as that of ardinal Newman for theism. In fact pantheism, though ot the whole truth, and almost as inconsistent as polyeism with the real facts of the universe as disclosed science, has a certain poetical truth in it, to which hords of human emotion vibrate responsively, and is erhaps not so widely in error as some of the extreme eories which treat matter as something base and brutal. Wordsworth's noble lines—

> A sense sublime
> Of something far more deeply interfused,
> Whose dwelling is the light of setting suns,

And the round ocean and the living air,
And the blue sky, and in the mind of man;
A motion, and a spirit that impels
All thinking things, all objects of all thoughts,
And rolls through all things—

pantheism, and yet we cannot but feel ourselves
at extent in sympathy with them.

lso the well-known lines of a greater than
orth, Shakespeare, are pure Buddhism:

The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve
And, like this insubstantial pageant faded,
Leave not a rack behind. We are such stuff
As dreams are made on, and our little life
Is rounded with a sleep.

can read these lines without feeling that the
t conception is as far as possible from being a
r vulgar one, and that the triviality and vul-

[redacted]

'No; God cannot *make* matter. Only artificial things show design, only things which can be made. What do you mean by saying a thing shows design? You only mean that by trying a man could make it.'

And he proceeded to illustrate it thus:—

'You show me a gold ring; the ring shows design, but not the gold; gold is an ultimate element, which can neither be made nor destroyed. When men can make a world, then they can prove that this one shows design, for the only way they know of design is by what they make.'

He went on to argue for the immortality of the soul, and as a consequence for its pre-existence and the transmigration of souls, from the conservation of energy; and concluded his argument against the creation and government of the world by a comprehensible, anthropomorphic Creator, by adducing the existence of evil.

'There is a sickness,' he said, 'called fever and ague; what do you call the medicine to cure that?'

'Quinine.'

'Yes; now we have not found that long; a good God would not have let so many people suffer if He could have given them that. A man found it by chance. The sickness and suffering in this life are for wrong done in another life.'

We may not accept this unproved theory of the cause of sickness and suffering, but it is very interesting to find that candid and intelligent minds, brought up in a society and religious beliefs so widely different from our own, have arrived practically at the same conclusions as John Stuart Mill, Herbert Spencer, and other leaders of advanced thought in modern Europe, and drawn almost identically the same line between that

s knowable and that which is unknowable by
ıan mind.

, however large-minded we may become in seeing
d in other forms of creed, we English of the
ıth century are not going to turn either pan-
or Buddhists, and practically the contest of the
day is between the supernatural or miraculous,
natural or scientific, hypotheses.

ording to the former the operations of the
e are carried on to a considerable extent by
ay be called secondary interferences of a super-
being, who with will, intelligence, and design,
man though vastly superior, frequently inter-
o alter the course of events and bring about
ng which natural law would not have brought
The other hypothesis cannot be stated better
Bishop Temple's words, that the Great First
reated things so perfect from the first that no

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vidence. *A priori*, I can conceive that the true ex-
lanation of the universe might have been natural law,
s the general rule, supplemented by miracles; just as
eadily as that it is law always, and miracle never.
The verdict must be decided by the weight of evidence.
The two theories must be called, face to face, before the
ribunal of *fact*, and its decision must be respected.
This is exactly what has been going on for the last two
enturies, and specially for the last half century, and the
ecord of decisions is now a very ample one. In every
ingle instance law has carried the day against miracle.

Instance after instance has occurred in which phe-
nomena which in former ages were attributed without
esitation to supernatural agencies have been conclu-
ively proved to be due to natural laws. Take the
bvious instance of thunder. When Horace wrote :—

> Jam satis terris nivis, atque diræ
> Grandinis misit Pater, et rubente
> Dextera sacras jaculatus arces
> Terruit urbem,

e wrote to a public to whom it was an undoubted
rticle of faith that thunder and lightning, hail and
nowstorms, came direct from the Father of the gods in
he sky. Even to a late period this was the general
aith, and the prayers in our rubric for rain or fine
weather remain as a survival of the belief that these
hings, when unusual or in excess, are supernatural
nanifestations. But Benjamin Franklin said, 'No, there
s nothing supernatural about lightning. I will bring
t down from the clouds and manufacture it by turning
a wheel.' Appeal being made to *fact*, the verdict is that
Franklin was right, and that lightning-conductors pro-
tect ships and houses better than prayers or incantations.

when Galileo and the Church joined issue as to
the earth was round or flat, inspiration and
y were cited in vain for the received theory;
l it was round, and it was proved to be so by
ling round it. The law of gravity was con-
a very dangerous heresy, and for a long time
ivines held out against its conclusions, and con-
that it was no better than atheism to doubt that
were signs of God's anger sent to warn a sinful
But Halley calculated the time of his comet's
according to the laws of gravity, and appeal
nade to fact, the comet returned true to time.
s has occurred so often that few are left who
he universal prevalence of law in the material
e, where former generations saw miracles at
urn. Nor is the defeat of miracle less conspi-
n the spiritual world. Where former ages and

[redacted]

and even those who cling to old beliefs must admit that the most cogent and irresistible evidence is requisite to establish the fact of a real supernatural interference. It may be taken as an axiom that wherever a natural explanation is possible, a miraculous one is impossible.

Now this is just the point on which, as knowledge has increased, the evidence for miracles has become weaker, almost in the exact ratio in which the necessity for evidence has become stronger.

Take, for instance, the following case recorded by Dr. Braid of Glasgow. Miss R. had suffered from ophthalmia and was totally blind. She could not discern a single letter of the title-page of a book placed close to her, though some of the letters were a quarter of an inch long. Dr. Braid placed the patient in a condition of hypnotism or artificial somnambulism, and directed the nervous force, or sustained attention of the mind, to the eyes by wafting over them. After a first sitting of about ten minutes she was able to read a great part of the title-page, and after four more sittings she was able to read the smallest-sized print in a newspaper, and was quite cured for the rest of her life. In another case, that of Mrs. S., blindness of the left eye had occurred owing to an attack of rheumatic fever, the structure of the eye, both external and internal, being considerably injured, and more than half the cornea covered by an opaque film. After a few sittings the cornea became transparent, and the patient was cured.

In both these cases the blind were made to see by processes which were purely mechanical, for hypnotism was induced by the simple means of making the patient strain her attention on some fixed idea or object, commonly on a black wafer stuck on a white wall, and the

ion of the optic nerve to greater activity did the nd if the blind could be made to see, *a fortiori* were made to hear, and the lame and halt to the same mechanical process. Here there is nation of nine-tenths of all recorded miracles by atural causes.

n, take the well-known case of the Berlin book- icolai, who, having fallen into ill-health, for a ar saw, when awake, visions so real and palpable nay be said to have lived in the company of dis- d spirits, undistinguishable from actual men and This is a common phenomenon in vivid dreams, Berlin case takes us a step farther, and shows subjective impressions may assume the form of realities, even in the case of a man wide awake, tical turn of mind, and in full possession of his g faculties. Why then should we be driven to native of miracle or imposture to account for

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of the old Northumberland House being seen by many passers-by to wag because one had asserted it, illustrates the contagiousness of nervous sympathy, and the tricks which 'strong imagination' can play with the senses.

Another great blow has been dealt against the miraculous theory by what can only be called the singular want of intelligence displayed in the exercise of miraculous power as commonly recorded. The *raison d'être*, or effect desired to be produced by miracles, is to convert mankind from sin, or to attest a divine mission by convincing proofs. Even ordinary human intelligence—and how much more so that of a superior Being—must see that to attain this end the means must be to make the proof convincing. There is no reason in itself why it should not be so. The fact that a man who was alive and signed a will is now dead, is attested as regards the latter proposition by a proper medical certificate, and as regards the former by two credible witnesses, who are prepared to come into court, give their names and addresses, depose on oath to the signature, and stand cross-examination. If this testimony is required to establish a fact so antecedently probable as that one particular man has undergone the common fate of millions of millions of other men, that is to say, that he has died after being alive, how much more must it be requisite to establish the fact so antecedently improbable, as that one man among those many millions after having died came back to life. And yet where is the recorded miracle for which even this *minimum* amount of testimony is forthcoming? Why are miracles so constantly performed in holes and corners, in obscure localities, among little knots of ignorant and enthusiastic adherents, attested by the

hearsay evidence of unknown or incompetent
es, and apparently under circumstances inevit-
lculated to defeat their object and engender
in the minds of reasonable and conscientious
Take, for instance, the miracles now said to be
t at Lourdes. The object must be taken to be
vert infidel France to the Catholic faith. But
ly this object would be far better attained by a
undoubted miracle wrought at Paris before a
sion headed by a man like Pasteur, than by any
of miracles scarcely, if at all, distinguishable
ose of Dr. Braid, alleged to occur at an obscure
in the presence of peasants and pilgrims. Or,
higher instance, that of the demand made by the
es to Jesus for a sign to attest his Messiahship.
er the circumstances of the case, and see if it is at
ible that if he had possessed the power of work-
racles he should have replied 'Why doth this

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and counting the cost, when he found that he was
cing no decided headway by preaching in a remote
vince, he determined to go to Jerusalem and make
re one great effort to accomplish his object. Can
e doubted that he would use every means in his
ver to carry his mission to a successful conclusion?
having the power to do so by working a miracle, he
refused, he would from his point of view have been
lty of a great sin—that of preventing the coming of
kingdom of heaven.

Again, who were the Pharisees? No doubt there
e formalists and hypocrites among them, but the
ition of the sect in the Jewish nation was almost
ctly similar to that of the English Puritans in the
n of Charles. They were the embodiment of the
riotic and religious spirit of the race, the sons of
heroic fathers who fought under Judas Maccabeus
inst Antiochus, the fathers of the equally heroic
s who made the last desperate stand against the
ions of Titus. It was their duty, when a claim to
ssiahship was advanced, before departing from the
litions of their ancestors, to require evidence. The
versally expected evidence of a temporal deliverer
ng wanting, there remained only the evidence of
acles, which, moreover, were assigned as the test
a Messiah by all their prophets. To refuse them
ign, if a sign were possible, was to do injustice to
ny sincere and conscientious men. Nay, more, it
s an act of cruelty if leaving them in their old faith
ailed eternal punishment. The same thing applies
all records of miracles. They are never wrought
ler circumstances where they would be the most
ctive means for attaining proposed ends. They are

rought under circumstances which leave them the suspicion of being subjective illusions terpretations of effects due to natural causes. ver convince any but those who are more than vinced already.

ould be easy to multiply instances showing equacy of the evidence adduced to establish exceptional and extraordinary fact as the oc- of a real miracle. But it is unnecessary to do thinking minds have come, or are fast coming, nclusion of Dr. Temple, that 'all the countless of the universe were provided for by one impress, and not by special acts of creation g what had previously been made.'

only when we look behind the phenomena of erse at this Great First Cause, that I see any- object to in the definition of Dr. Temple, and

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ood Creator, how can we escape the inference that the xistence of evil proves an evil one ? This is never so ɔrcibly impressed on me as when I read the arguments f those who insist most strongly on the conception of one, anthropomorphic God. When Carlyle says, 'All hat is good, generous, wise, right—whatever I deliberately and for ever love in others and myself—who or what could by any possibility have given it to me but One who first had it to give ? This is not logic, but ıxiom.' I cannot but picture to myself the sledge-ıammer force with which, if he had approached the juestion without prepossessions, he would have come lown on the cant, the insincerity, the treason to the ternal veracities, which refused to look facts in the ace, and apply the same reasoning to the evil. Or if Arnold defines the Deity as the 'Something not ourselves which makes for righteousness,' how of the Something not ourselves which makes for unrighteousıess ? The only escape I can find from this dilemma s to accept existing facts and not evade them. It is ı fact that polarity is the law of existence. Why we know not, any more than we know the real essence and ɔrigin of the atoms and energies which are our other ultimate facts. But we accept atoms and energies, and ıccept the law of gravity and other laws ; why not ıccept also the law of polarity, and admit that it is part of the 'original impress': one of the fundamental conditions under which the evolution of Creation from its ultimate elements is necessitated to proceed. This the human mind can understand ; beyond it is the great unknown or unknowable, in presence of which we can only feel emotions of reverence and of awe, and 'faintly trust the larger hope' that duality may somehow

ly be merged in unity, evil in good, and 'every urn to spring.'

ations advanced in civilisation there has always endency among the higher and purer minds to the Great First Cause further and further back unknown, and to divest it of anthropomorphic es. When Socrates said, 'that divinely revealed of which you speak, I deny not, inasmuch as I now it ; I can only understand human reason,' e the identical language of Darwin, Spencer, and those leaders of modern thought whom ans call agnostics. Even in religions based on of a single anthropomorphic Deity the same y often appears among the highest thinkers. mmanuel Deutsch, in his learned work on the , tells us, 'Its first chapter treats of the Deity ived by Jewish philosophy. The existence of

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the midst of a string of definitions all implying that God is comprehensible, has the words 'the Father incomprehensible.'

It is evident that the reasons why these anticipations of the prevailing tendency of modern thought only appeared by glimpses, and among a very limited number of philosophic minds, arose from the fact that the miraculous theory of the universe everywhere prevailed. Every unusual occurrence was supposed to be owing to the direct supernatural interference of a Being acting in the main with human attributes, and therefore to be a direct refutation of the theory which denied the possibility of defining His attributes, and relegated Him to the dim distance of an incomprehensible Creator. With the utter breakdown of the miraculous theory, and the certainty that all the countless varieties of the universe arise, not from special interferences, but from one original impress, this theory of a reverent and devout agnosticism becomes impregnable and holds the field against all rivals. It, and it alone, is consistent with the facts of science, the deductions of reason, the axioms of morality, while at the same time it denies nothing, and leaves an ample background on which to paint the visions of faith, and to reflect back to us spectral images of our hopes and fears, our longings and aspirations.

Some seek for a solution of the mystery, and try to reconcile the existence of evil with that of an almighty and beneficent Creator, by assuming that in the long run everything will come right. Evolution, they say, has led constantly to higher and better things, and when carried far enough will lead to a state of society in which wars will cease, evil passions die out, and

l love and charity prevail—in other words, to a
um.

if this were true, what of the untold millions of
an race who have perished in their sins while
n was slowly working out this tardy millen-
Are they the *chair à canons*, whom a Napoleon-
ty sacrifices with cynical indifference, in the
d moves of the game of Creation? Is this
a of an all-wise and all-merciful Father who is
n?

again, is it true that evolution works con-
or good and promises to bring about such a
um? It is doubtless true that evolution means
, and the ever-increasing development of the
l more complex and differentiated from the simple
orm. But is this all for good, or all for happi-
d is not evolution, like everything else, subject

physical conditions, though here the contrast is most apparent. An intelligent traveller who recently circled the world, surveying mankind with a keen and impartial eye 'from China to Peru,' says, as the result of his experience, 'The traveller will not see in all his wanderings so much abject repulsive misery among human beings in the most heathen lands, as that which startles him in his civilised Christian home, for nowhere are the extremes of wealth and poverty so painfully presented.' This is perfectly true; but it would be a rash conclusion to infer that civilised and Christian countries are worse than heathen lands, or that those who march in the van of progress and succeed in the struggle for life, have a larger dose of original sin than the laggards and those who fail.

Accumulations of population and accumulations of capital are alike causes and effects of progress in an industrial age. But you can no more have a north without a south pole, than you can have this progress without its counterpart of suffering. When an educated gentleman was, like the good vicar,

> Passing rich with forty pounds a year,

how many struggles and how many heart-aches were avoided. When 'merry England' dwelt in rural hamlets and villages, the 'bitter cry' of East London could scarcely have been written. Turn it as you like, increase of population means increase of poverty. Say that only five per cent. fail in the battle of life, from their own or inherited faults; from bad luck, ill-health, weakness of mind, adverse surroundings; five per cent. on thirty millions is a larger figure than five per cent. on ten millions. And the lot of those who fail is

ted by the success of those who succeed. The
living rises, and the cost of living increases,
ompetition becomes keener. Increase of popu-
n a limited area means increased difficulty of
employment; and the complex relations of in-
nal commerce send panics and crises vibrating
out the world, which throw millions out of
r reduce them to starvation wages. In simple
f society every one accepts the condition in
e finds himself as a matter of course, while in
complex civilisation the fiend Envy steps in, and
the baser natures who are failures, to regard
ccess as an insult and every successful man as
y. Hence Labour rises in mad revolt against
Socialists attack society with dynamite; and
theorists preach a millennium to be attained
shing private property and individual liberty.

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for good or evil. Why then should we believe that evolution, which, carried thus far, has developed more strongly the contrast between good and evil, will, if carried a little farther, extinguish it by annihilating the evil?

In fact, the good and evil resulting from the higher evolution of society are so equally balanced that it depends very much on place, time, and temperament whether we are optimists or pessimists. If my liver acts properly I am an optimist; if it is out of order, a pessimist. Personally I incline to optimism—that is, I think that this world, if not exactly 'the best of all possible worlds,' is yet on the whole a very tolerable world, and that life to the majority, and on the average, is worth living. I think also that progress is certainly towards higher, and very probably towards happier, conditions. It seems to me that in the most advanced English-speaking communities, the condition of at least one half—viz. the female half—of the population is distinctly better, and that the working class, who form the majority of the male half, though many are worse off than formerly, are, on the whole, better fed, better clothed, better educated, and better behaved.

This, however, is perhaps very much a matter of temperament. Greater minds than mine have seen things differently and inclined to pessimism. Buddhism, and almost all Oriental religions and philosophies, are based upon it, and look to Nirvana or annihilation of personal identity as the supreme bliss. Pauline Christianity assumes that all mankind, except a few chosen vessels, are so hopelessly bad as to be predestined to eternal damnation. And even more remarkable, Shakespeare, the universal genius, who one would say had as

temperament and led as successful a life as any
l his moods of despondency in which he could

> When in disgrace with fortune and men's eyes,
> I all alone bemoan my outcast state;
> Wearying deaf heaven with my fruitless cries,
> And look upon myself, and *curse my fate.*

re with Hamlet that no one would bear the ills

> He himself could his quietus make
> With a bare bodkin.

stances like these, and the disgust of life mani-
so many modern societies by the increase of
and the spread of pessimistic theories like
Schopenhauer and Hartmann, who can deny
great magnet of modern civilisation has a
well as a north pole, and that progress is not
rds perfection ?

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The great advantage of this form of religious hypothesis, which for want of a better name I call Zoroastrianism, is that, in the first place, it gets rid of the antagonism between religion and science, for there is no possible discovery of science which is irreconcilable with the fact that there is a necessary and inevitable polarity of good and evil, and in the background a great unknown, which may be regarded with those feelings and aspirations which are inseparable from human nature. And secondly, there is the still greater advantage that we can devote ourselves with a whole heart and sincere mind to the worship of the good principle, without paltering with our moral nature by professing to love and adore a Being who is the author of all the evil and misery in the world as well as of the good. If it were really true that there were such a Being as theologians describe, who created the immense majority of the human race vessels of wrath doomed to eternal punishment, either from pure caprice or to avenge the slight offered to Him by the disobedience of a remote ancestor, what would be the attitude of every healthy human soul towards such a Being? Rather that of Prometheus or Satan, than of Gabriel or Michael; of heroic defiance than of abject submission. We may gloss this over in words, but the fact remains, and it is difficult to overestimate the amount of evil which has resulted in the world from this confusion of moral sentiments which has made good men do devil's work in the belief that it had divine sanction.

The horrors of demonology and witchcraft had their origin in texts of the Old Testament; religious wars and persecutions arose out of the fundamental error that intellectual acceptance of doubtful dogmas was the one

ecessary for salvation; and ruthless cruelty was by an appeal to God's anger with Saul for to hew in pieces the captive Amalekites. A of Zoroaster would see at once that these were f Ahriman and not of Ormuzd, and that in tak- in them he was deserting the standard under he had enlisted, and doing deeds of darkness retending to serve the Prince of Light. This being a soldier enlisted in the army of light o me to afford one of the strongest practical ents to hate what is evil and cleave to what A bad deed or foul thought is felt to be not ong but dishonourable: a disloyal going over enemy and abandonment of the chief under we had enlisted, and of the comrades with ve had served. This is a very strong motive, n in the humble ranks of the Salvation Army see how powerfully it operates to make men

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to contribute their mite. But always for the 'love of Jesus,' for the 'Saviour's sake,' as an offering to the 'dear Redeemer.' Theological Christianity says that the one thing needful is to believe in the Catholic Faith as defined by the Athanasian Creed, without which we shall 'without doubt perish everlastingly.' Practical Christianity has completely dropped the Holy Ghost as a sort of fifth wheel to the coach, and relegated the Father into ever vaguer and greater distance; while it has fastened more and more on the figure of Jesus of Nazareth as the practical living embodiment of the good principle of the universe. In a word, Christianity, as it has become more reasonable, more charitable, more pure, and more elevated, has approximated more and more to Zoroastrianism, and for practical purposes modern Christians are, to a great extent, without knowing it, worshippers of Ormuzd, with Christ for their Ormuzd.

To this I see no sort of objection. The tendency to personify abstract principles in something which is warmer, dearer, nearer to ourselves, is ineradicable in human nature; and especially among the great masses of mankind who cannot rise to the height of philosophical speculations. It is impossible in the present age to invent new personifications, or to revive old ones. Jesus has the immense advantage of being in possession of the field, with all the accumulated love and reverence of nineteen centuries of followers. It would be difficult to invent a better ideal or a more perfect example. No doubt the ideal, like all human conceptions, is not absolutely perfect; it is subject to the law of polarity, and its excellences, if pushed to the 'falsehood of extremes,' in many cases become faults. It would not

ractice if smitten on one cheek to turn the other, ke no thought for the morrow and live like the s. The opposition between the flesh and the also stated so absolutely, that it is apt to lead rren and ignoble asceticism. But those are elewhich, practically, are not likely to be pushed to and which serve rather to mitigate the tendenmodern civilisation to an undue preponderance pposite polarities of selfishness, worldliness, and ty. Courage, hardihood, self-reliance, foresight, of progress, and a desire to attain independence, ays remain prominent virtues, especially of the races, and the gentler teachings of Christianity g be wanted as an influence to soften, to elevate, purify. By all means, therefore, let Christians Christians, and see in Christ their Ormuzd, or ication of the good principle. Only let them

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l facts and real laws of the universe. He is the ght example of the highest ideal of human virtue, ; on account of miracles, but in spite of them ; not :ause he was a transcendental abstraction with attri- :es altogether outside of human experience or con- ›tion; but because he was a man whom other men ı love and other men can strive to imitate. The ;mas and miracles may quietly fade out of sight, as many articles of the Athanasian Creed have already ıe, like mists before the rising rays of larger know- ge and purer morality, and yet the essence of ristianity will remain, as a worship of the good and .utiful, personified in the brightest example which been afforded—that of Jesus, the son of the car- ıter of Nazareth.

CHAPTER XII.

CHRISTIANITY AND MORALS.

y based on morals—Origin of morality—Traced in Judaism—
tes in evolution—Instance of murder—Freedom of will—Will
led in certain states of brain—Hypnotism—Mechanical theory
stablished harmony—Human and animal conscience—Analysis
-Explained by polarity—Practical conclusion.

at advantage which Christianity possesses over
er religions is that it is based to a much greater
n the solid foundation of an elevated moral-

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from theologians, priests, and politicians, than from the instincts of the millions ; and this it is which enables it to retain such a wonderful vitality even in modern times, when faith in dogmas and miracles has been so greatly weakened. In order to appreciate the solidity of this basis it is necessary to understand the origin of morals, and to see that the fundamental precepts of moral law are not mere chance inventions of a few exceptional minds, or the teachings of doubtful revelations, but are the necessary growth and products of human nature, in the course of the evolution of society from rude beginnings to a high civilisation. This gives them a certainty and sanction which could be derived from no other source, and makes them what in fact they have become—almost primary instincts of the natural and normal mind in civilised communities. I proceed, therefore, to endeavour to trace shortly the process by which moral laws have originated and grown up to their present certainty and cogency in the course of evolution.

As I have already said, the element of morality is one of the latest to be developed in religious conceptions. The first impressions of savage races reflect the feelings of vague superstitious terror with which they regard unknown phenomena and powers. They are afraid of ghosts and afraid of thunder, long before they rise to a belief in a future state of rewards and punishments, or to the notion of an almighty Being acting by natural laws. In a higher state of development they personify natural powers in gods, who have no more idea of morality than if they were so many parallels of latitude or degrees of longitude ; and they invent tribal gods, who are simply great chiefs, bound by no laws, but granting favours when appeased and inflicting injuries

ngry. By slow degrees, as civilisation advances, leas are evolved, and the more enlightened minds o attribute moral attributes to their deities. men, prophets, and reformers take up these d preach them to the world, and, if circumstances urable and the soil prepared, they take root and popular convictions, surviving in the struggle , and becoming stronger from generation to ion.

s evolution of moral ideas is most clearly traced religious history of the Jews. In their earlier ions Jehovah is represented with all the traits lous and capricious Oriental sultan. The one n his eyes is implicit obedience; the one unble crime, anything that looks like disrespect. is the man after God's own heart, though he s crimes of the foulest description, and treats as

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nd yet thé enemies of Jehovah waxed and his chosen eople waned. It must be that He was offended with ıem because He required something better than the lood of bulls—justice and mercy. So taught the opular preachers of the day—men like Isaiah and .mos—and by degrees their words found acceptance. ; was not, however, until the Captivity that these ideas f morality were wrought into the Jewish nation so as) become, so to speak, flesh of their flesh and blood of ıeir blood, as they have remained ever since. Whether was contact with the more advanced moral ideas of ligions like those of Buddha and Zoroaster, or, more robably, their sufferings from the cruelty and injustice ' their conquerors, the Captivity certainly made them new nation, attached ardently to morality and mono-.eism—thus effecting in a few years, and by purely ıman agencies, what, according to received beliefs, nturies of miraculous dispensation had failed to ac-mplish. How speedily and how effectually the work ıs done appears from that most interesting narrative the domestic life of a middle-class Jew of Nineveh, : Book of Tobit. The simple piety and homely usehold virtues are almost identically the same as ɔse of many a Jewish family living to-day in Lon-ı or Frankfort. From that time forward Jewish rality maintains a high level, and in the age im-diately preceding Christianity it had attained great rity and spirituality in the school of the early doc-s of the Talmud, and of the Jewish colony of Alex-lria. The Sermon on the Mount, beautiful as it is, ɔut an admirable *résumé* of maxims which are to be nd in the works of Philo and other Jewish teachers, l which were current in the synagogues of the

Iillel, who was president of the Sanhedrin when vas born, when asked what was the law, replied, t unto another what thou wouldst not have an- o unto thee. This is the whole Law, the rest commentary.' And again, 'Do not judge thy ur until thou hast stood in his place.'

Talmud anticipates in a wonderful degree not e moral precepts of the Gospel, but to a great ts phraseology and technical terms. 'Redemp- grace,' 'faith,' 'salvation,' 'Son of man,' 'Son of kingdom of heaven,' were all, as Deutsch shows, nted by Christianity, but were household words mporary Judaism. In one respect only Christi- ows a higher evolution of morality than Judaism s universality. Pure Judaism hardly rises above of 'neighbour,' or those who were of the same common faith; while Christianity, as enlarged

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at the idea, and even a brutal ruffian like Bill Sikes becomes an accursed thing to himself and his companions when he has transgressed the commandment 'Thou shalt do no murder.' But is it so everywhere, and was it so always? By no means; the Fiji islander kills and eats a stranger or enemy without scruple; the Red Indian and the Dyak are not accounted men until they have murdered some one and brought home his scalp or his head as a trophy. Even at a late period among ourselves murder was considered to be rather as a civil injury, to be met by compensation, than as a crime; and a regular tariff was established of the amount to be paid according as the victim was a slave or a freeman.

The origin and progress of the idea that murder is a crime can almost be traced step by step. The wife of a rude savage does something which offends him; a violent perception of anger flashes from the visual organ to the perceptive area of the brain, and a reflex action flashes from it along the motor nerve to the muscles of the arm. He strikes and kills her, almost as unconsciously and instinctively as he walks or breathes. But other perceptions follow on the act. He finds next day that he has no one to cook his food; the image of her dying face photographed on his brain is an unpleasant one; and thus by degrees a series of secondary perceptions get attached to the primary one of striking when he feels angry. If he gets another wife who again provokes him, the primary perception calls up the secondary ones, and the nerve-centres of his brain, instead of being solicited only in one direction, are acted on in opposite ways by conflicting impressions. He hesitates, and, as the primary impulse of passion is probably the more

ent, the restraining impulses prevail, and every
ey prevail they acquire more strength. Gradu-
y extend to a conviction that it is both inconve-
nd disagreeable to kill any one with whom he is
related either by family or tribal ties, and that, in
murder does not pay, and is wrong, unless prac-
n an enemy. This idea accumulates by here-
d evidently those tribes or races in whom it is
st will have an advantage in the struggle for life
most likely to survive.

n this point the idea may be traced historically,
ng and widening from generation to generation
sation advances, until in the higher races it as-
he form of an instinctive abhorrence of murder
bstract, as we find it at the present day.

a mistake to suppose that the foundations of
y are in any way weakened by thus tracing them

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limited portions of the human race, and under conditions which leave large scope for legitimate doubt, and which, in point of fact, failed to ensure recognition for its moral precepts among His own chosen people for a long period after its promulgation.

But on the scientific theory of the evolution of morality by natural laws it stands on an impregnable footing. No one can deny that, as a matter of fact, such instincts do prevail, and have become part of the nature of all the best men and best races, and that each successive generation tends to fix them more firmly Mathematical laws are not the less certain because they can be traced back to counting on the fingers, and moral laws will continue to have a certainty and cogency, scarcely inferior to the axioms of mathematics, although we can trace them back to origins as rude as the attempts of the Australian savage to extend his perceptions of number beyond 'one, two, and a great many.'

The real difficulty is not in tracing the origin of these instincts of morality, but in that fundamental difficulty which underlies all theories of reconciling the consciousness of free-will with the material attributes with which it is indissolubly associated. Without freedom of will there can be no conscience, no right or wrong in acting in accordance or otherwise with the instincts of moral law, however those instincts may have been derived. Now it is certain that the will, like life, memory, consciousness, and other mental functions, is, so far as human knowledge extends, indissolubly connected with matter and natural laws, in the form of certain motions of the cells which form the grey substance of the nerves and of the nervous ganglia of

the cortex of the brain is the most considerable. conclusively proved by experiment. We know y removing certain portions of the brain of a dog pigeon, we can destroy the power of motion reserving the will, and by removing certain other s we can destroy the will while preserving the of motion. Take away a certain portion of the f a pigeon, and although it retains the power of food, it has so totally lost the will to exercise wer that it will starve in the midst of abundance, it can be kept alive by placing the food in its

In like manner, in the human brain there are portions which, if destroyed by injury or dis- ill paralyse the power of giving effect to the will cular movements, while the destruction of other s will paralyse the will which originates such ents. Numerous cases are recorded in medical s in which the will is completely paralysed for

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stance of this is recorded by Dr. Braid, in which an old lady, who had a true puritanical abhorrence of dancing as sinful, being hypnotised, began capering about the room when a waltz tune was struck up, on being told to do so by the operators.

There are some other curious effects produced by hypnotism, in the way of inducing a sort of double consciousness and memory, which makes people in this condition totally forget things which they remember when awake, and remember things which were totally forgotten in the waking state.

These and a variety of other instances point to the conclusion that man is only a conscious machine. In other words, that the original impress, to use Dr. Temple's words, was so perfect that it provided a pre-established harmony not only for the innumerable phenomena of the material universe as unfolded by evolution, but for the still more innumerable phenomena of life in all its manifestations and all its complex relations to outward environment. I say of *life*, for we clearly cannot confine the theory to human life. A dog, who with the two courses before him of doing wrong and chasing a rabbit, or doing right and remaining at his master's heel, chooses one of them, is in exactly the same position as Hercules between the rival attractions of virtue and pleasure. If Hercules acted as a machine, yielding to the pre-established preponderance of the stronger attraction, so did the dog; but if Hercules exerted free-will and felt the approval or blame of conscience, so did the retriever. There is no fundamental distinction, but merely a question of degree, between human conscience and the shame which a dog feels when it knows that it has done wrong, and the

e which it manifests when conscious that it has
l properly.

ll we thus conclude, as Leibnitz and other
hilosophers have done, in favour of the mechanical
? But if we do, how are we to account for the
ive ineradicable feeling, which comes home to
ne with a conviction even stronger than the
e of the senses, that we really have a choice
n opposite courses, and can decide on our own
—a conviction which is obviously the foundation
onscience and of all morality?

us try to analyse more closely what Will really
and under what conditions it is manifested. The
which connects any one single perception with
through sensory nerve, sensory centre, motor
motor nerve and muscle, is as purely mechanical
of an electric circuit. Reflex motions such as
ng and even more complex motions which by

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, one of the categories of thought, or primary lds in which thought is cast. We do not know ; space and time really are in their essence, or why are the necessary conditions of thought, any more we do in the case of will. They may be illusions, we accept them, and of necessity accept them, as . For all practical purposes it is the same to us, we understood their essence and knew them to be ies. A man can no more doubt that he is an idual being, with a will which, in a great many , enables him to decide which of a variety of lses shall prevail, than he can hesitate, if he is shing a room, to regulate his purchase of carpeting paper by space of three dimensions, without regard ssible speculations as to quaternions.

'erhaps the principle of polarity may assist us in rstanding that both theories may be true; or rather matter and spirit, necessity and free-will, may be site poles of one fundamental truth which is beyond omprehension. We cannot shake off this principle larity, and arrive at any knowledge, or even con- on, of the absolute truth in regard to the atoms, ies, and natural laws, which make up the universe atter and of all the ordinary and material functions e; why should we expect to do so in the higher festations of the same life, which have been arrived the later stages of one unbroken course of evolu- from monad to man?

'his, at any rate, is the theory which best satisfies wn mind and enables me to reduce my own indi- l chaos into some sort of a cosmos. I draw from following conclusions :—

'or all practical purposes assume that 'right is

nd that the moral instincts, however they have med, are imperative laws. Assume also that

> Man is man and master of his fate,

t we have, to a great extent, the power of what to do and what not to do. But in doing the mind open to all conclusions of science, and reely that these assumptions are indissolubly ed with natural laws and with material organs, t man is to a very great extent dependent on ronment and his place in evolution, both for his code and for the force of will and conscience nable him to conform to it. Learn therefore the of a large toleration and of charity in thought l, towards those who, from inherited constitution tunate conditions of education and outward cir- ces, fall under the sway of the principle of evil, d bad useless and unlovely lives. Had you

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CHAPTER XIII.

ZOROASTRIANISM.

Zoroaster an historical person—The Parsees—Iranian branch of Aryan family—Zoroaster a religious reformer—Scene at Balkh—Conversion of Gushtasp—Doctrines of the 'excellent religion'—Monotheism—Polarity—Dr. Haug's description—Ormuzd and Ahriman—Anquetil du Perron—Approximation to modern thought—Absence of miracles—Code of morals—Its comprehensiveness—And liberality—Special rites—Fire-worship—Disposal of dead—Practical results—The Parsees of Bombay—Their probity, enterprise, respect for women—Zeal for education—Philanthropy and public spirit—Statistics—Death and birth rates.

ZOROASTRIANISM is commonly supposed to derive its name from its founder Zoroaster, a Bactrian sage or prophet, who lived in the reign of King Gushtasp the First. Zoroaster's name has come down to us from antiquity in much the same relation to this form of religion as that of Moses to Judaism, or of Sakya-Mouni to Buddhism. As in those cases, certain learned commentators have endeavoured to show that the alleged founder was purely mythical and had no real historical existence, basing their argument mainly on the fact that a number of supernatural attributes, and embodiments of metaphysical and theological ideas, became attached to the name, just as a whole cycle of solar myths became associated with the name of Hercules. But this seems to be carrying scepticism too far. Experience shows that religions have generally

ed in the crystallisation of ideas floating in at certain periods of the evolution of societies, e nucleus of some powerful personality. Nearly reat religions of the world, such as Buddhism, anism, Christianity, and Mahometanism, clearly orical founders, and it would be hypercritical to at such a man as Jesus of Nazareth really lived many of his sayings and doings may be traced cations, more or less erroneous, of ancient pro- or because his human nature became transfigured Logos and other metaphysical conceptions of xandrian philosophy.

he case of Zoroaster, the argument for his his- existence seems even stronger, for his name is d with historical reigns and places, and his early history contains nothing supernatural or ble. He is represented as simply a deep thinker erful preacher, like Luther, who gave new form

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f Zoroaster to be true, and by confining myself to the road, leading principles of his religion, without dwell- ıg on its varying phases, or on the mythical legends ıd ritualistic observances which, as in the case of all ther old religions, have crystallised about the primitive lea and the primitive founder.

Zara-thustra, or, as he is commonly called, Zoroaster, nd the religion which goes by his name, are known to s mainly from the sacred books which have been pre- rved by the modern Parsees. The Parsees, a small mnant of the Persians who under Cyrus founded one f the mightiest empires of the ancient world, flying om their native country to escape from persecution fter the Mahometan conquest, formed a colony in India, nd are now settled at Bombay. They form a small ut highly intelligent community, who have preserved ıeir ancient religion, and, fortunately, some consider- ble fragments of their sacred scriptures. The oldest f these are written in the Gata dialect of the Avesta r Zend language, which is contemporary with Sanskrit, ıd bears much the same relation to it as Latin does Greek. The primitive Aryan family at some very mote period became divided into two branches, and ıdiated from their Central Asian home in two direc- ons. The Hindoo branch migrated to the south into ıe Punjaub and Hindostan; the Iranian westwards, ıto Bactria and Persia; while other successive waves f Aryan migration in prehistoric times rolled still ırther westwards over Europe, obliterating all but a w traces of the aboriginal population.

The period of this separation of the Iranian and Iindoo races must be very remote, for the Rig-Veda is robably at least 4,000 years old, and the divergence

its form of Sanskrit and the Gata dialect of the already as great as that between two kindred an languages such as Greek and Latin. The nce of religious ideas is also evidently of very te. In the Hindoo, and all other races of the e Aryan stock, the word used for gods and good is taken from the root 'div,' to shine. Thus, in Sanskrit, Zeus and Theos in Greek, Deus in Tius in German, Diews in Lutheranism, Dia in ew in Kymric, all mean the bright or shining esented by the vault of heaven. But in Iranian d has an opposite sense, and the 'deevs' corre- o our 'devils.'

primitive Aryan religions were evidently all from a contemplation of the powers and pheno- nature. The sky, with its flood of light and ethereal blue, was considered to be the highest tation of a Supreme Power; while the sun and

Some 3,200 years ago a sight might have been seen in the ancient city of Balkh—the famous capital of Bactria, the 'Mother of Cities'—very like that witnessed some fourteen centuries later at our own Canterbury. The king and his chief nobles and courtiers were assembled to hear the discourse of a preacher who proposed to teach them a better religion. Gushtasp listened to Zoroaster, as Ethelbert listened to Augustine, and in each case reason and eloquence carried conviction, and the nation became converts to the new doctrine.

This conversion was effected without miracles, for it is expressly stated in the celebrated speech of the prophet, preserved in the 30th chapter of the Yasna, that he relied solely on persuasion and argument. Ferdousi, the Persian Homer, thus describes the first interview between Zoroaster and Gushtasp: 'Learn,' he said, 'the rites and doctrines of the religion of excellence. For without religion there cannot be any worth in a king. When the mighty monarch heard him speak of the excellent religion, he accepted from him the excellent rites and doctrines.'

The doctrines of this 'excellent religion' are extremely simple. The leading idea is that of monotheism, but the one God has far fewer anthropomorphic attributes, and is relegated much farther back into the vague and infinite, than the god of any other monotheistic religion. Ahura-Mazda, of which the more familiar appellation Ormuzd is an abbreviation, means the 'All-knowing Lord;' he is said sometimes to dwell in the infinite luminous space, and sometimes to be identical with it. He is, in fact, not unlike the inscrutable First Cause, whom we may regard with awe and reverence, with love and hope, but whom we can-

tend to define or to understand. But the radical
ce between Zoroastrianism and other religions is
does not conceive of this one God as an omnipo-
eator, who might make the universe as he chose,
erefore was directly responsible for all the evil
but as a Being acting by certain fixed laws, one
h was, for reasons totally inscrutable to us, that
ce implied polarity, and therefore that there could
ood without corresponding evil.

Haug, who is the greatest authority on all ques-
nnected with the Zend scriptures, says: 'Having
at the grand idea of the unity and indivisibility
upreme Being, Zoroaster undertook to solve the
roblem which has engaged the attention of so
ise men of antiquity and even in modern times,
are the imperfections discernible in the world,
ious kind of evils, wickedness, and baseness,

ınknown First Cause, who comprehends within himself ›oth principles as a necessary law of existence, and in vhom believers may hope that evil and good will ultinately be reconciled.

Anquetil du Perron, the first translator of the Zend-vesta, in his 'Critical View of the Theological and Cereıonial System of Zar-thurst,' thus sums up the Parsee reed: 'The first point in the theological system of oroaster is to recognise and adore the Master of all ıat is good, the Principle of all righteousness, Ormuzd, ;cording to the form of worship prescribed by him, and ith purity of thought, of word, and of action, a purity hich is marked and preserved by purity of body. ext, *to have a* respect, accompanied by gratitude, for e *intelligence* to which Ormuzd has committed the re of nature (i.e. to the laws of nature), to take in ır actions their attributes for models, to copy in our ›nduct the harmony which reigns in the different arts of the universe, and generally to honour Ormuzd ı all that he has produced. The second part of their eligion consists in detesting the author of all evil, ıoral and physical, Ahriman—his productions, and his orks; and to contribute, as far as in us lies, to exalt ıe glory of Ormuzd by enfeebling the tyranny which ıe Evil Principle exercises over the world.'

It is evident that this simple and sublime religion is ıe to which, by whatever name we may call it, the best ıodern thought is fast approximating. Men of science ke Huxley, philosophers like Herbert Spencer, poets ke Tennyson, might all subscribe to it; and even enlightıed Christian divines, like Dr. Temple, are not very r from it when they admit the idea of a Creator beınd the atoms and energies, whose original impress,

n the form of laws of nature, was so perfect as to no secondary interference. Admit that Christ is t personification of the Spenta Mainyush, or good le in the inscrutable Divine polarity of existence, nan may be at the same time a Christian and a trian.

e religion of Zoroaster has, however, this great ige in the existing conditions of modern thought, is not dragged down by such a dead weight of nal dogmas and miracles as still hangs upon the of Christianity. Its dogmas are comprised in the ent that there is one supreme, unknown, First who manifests himself in the universe under aws which involve the principle of polarity. hardly so much a dogma as a statement of fact, the ultimate and absolute truth at which it is e for human faculty to arrive. No progress of

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later writings in the Pehlvi language, as of his conception by his mother drinking a cup of the sacred Homa, but these are of no authority and form no part of the religion. On the contrary, the original scriptures which profess to record his exact words and precepts disclaim all pretension to divine nature or miraculous power, and base the claims of the 'excellent religion' purely on reason. This is an immense advantage in the 'struggle for life,' when every day is making it more impossible for educated men to believe that real miracles ever actually occurred, and when the evidence on which they were accepted is crumbling to pieces under the light of critical enquiry. The Parsee has no reason to tremble for his faith if a Galileo invents the telescope or a Newton discovers the law of gravity. He has no occasion to argue for Noah's deluge, or for the order of Creation described in Genesis. Nay even, he may remain undisturbed by that latest and most fatal discovery that man has existed on the earth for untold ages, and, instead of falling from a high estate, has risen continuously by slow and painful progress from the rudest origins. How many orthodox Christians can say the same, or deny that their faith in their sacred books and venerable traditions has been rudely shaken?

The code of morality enjoined by the Zoroastrian religion is as pure as its theory is perfect. Dr. Haug enumerates the following sins denounced by its code, and considered as such by the present Parsees: Murder, infanticide, poisoning, adultery on the part of men as well as women, sorcery, sodomy, cheating in weight and measure, breach of promise whether made to a Zoroastrian or non-Zoroastrian, telling lies and deceiv-

e covenants, slander and calumny, perjury, dis-
appropriation of wealth, taking bribes, keeping
e wages of labourers, misappropriation of re-
property, removal of a boundary stone, turning
out of their property, maladministration and
ng, apostasy, heresy, rebellion. These are posi-
nctions. The following are condemnable from a
s point of view: Abandoning the husband; not
ledging one's children on the part of the father;
towards subjects on the part of a ruler; avarice,
, illiberality and egotism, envy. In addition
re a number of special precepts adapted to the
rites of the Zoroastrian religion which aim
lly at the enforcement of sanitary rules, kind-
animals, hospitality to strangers and travellers,
to superiors, and help to the poor and needy.
evident that this is the most complete and com-

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animals is specially enjoined, and it is considered a sin to ill-treat animals of the good creation, such as cattle, sheep, horses, or dogs, by starving, beating, or unnecessarily killing them. With true practical wisdom, however, the 'falsehood of extremes' is avoided, and this precept is not, as in the case of Brahminism and Buddhism, carried so far as to prohibit altogether the taking of animal life, which is expressly sanctioned when necessary. This sober practical wisdom, or what Matthew Arnold calls 'sweet reasonableness,' is a very characteristic feature of Zoroaster's religion, and very remarkable as having been taught at so early a period in the history of civilisation.

Another precept, which might well have been made by an English board of health in the nineteenth century, is not to pollute water by throwing impure matter into it.

The only special Parsee rites which would be unsuited for modern European society, are the worship of the sacred fire and the disposal of the dead. It is true that the former is distinctly understood to be merely a symbol of the Deity, and used exactly as water is in baptism, or as the ascending flame of candles and smoke from swinging incense are in the Catholic ritual, to bring more vividly before the minds of the worshippers the idea of the spirit soaring upwards towards heaven. Still, in modern society fire is too well understood as merely a particular form of chemical combination, and is too familiar as the strong slave and household drudge of man, to acquire a leading place in a religious ritual where it has not been hallowed by the usage of a long line of ancestors and the traditions of a venerable antiquity. All that can be said is, that if religious

... formulæ which ...
cance.

Another Parsee rite, wh
general usage, is that of
towers of silence, where the
devoured by birds of prey.
motive of not defiling the p
water, by corruption; but it
the conditions of civilisation
in crowded cities under a hun

There is little prospect
conversion to the sect of Zor
probable is the gradual tr
modes both of religious and s
thing which is, in principle,
'excellent religion' taught by

The miraculous theory of
ally dead, the only theory that
feelings, and the ineradicable e
the human mind with the in
of science, is that of a remote
and incomprehensible First Ca

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True religion consists in a recognition of this truth, a feeling of reverence in presence of the unknown, and, above all, a feeling of love and admiration for the good principle in whatever form it is manifested, in the beauties of nature and of art, in moral and physical purity and perfection, and all else that falls within the domain of the Prince of Light, in whose service, whether we conceive of him as an abstract principle, or accept some personification of him as a living figure, we enlist as loyal soldiers, doing our best to fight in his ranks against the powers of evil.

The application of the all-pervading principle of polarity is exemplified in the realm of art. The glorious Greek drama turned mainly on the conflict between resistless fate and heroic free-will, and is typified in its highest form by Æschylus, when he depicts Prometheus chained to the rock hurling defiance at the tyrant of heaven. Our own Milton, in like manner, gives us the spectacle of the fallen archangel opposing his indomitable will and fertile resources to the extremity of adverse circumstance and to Almighty power.

The greatest of modern dramas, Goethe's 'Faust,' turns so entirely on the opposition between the human soul striving after the infinite, and the spirit *der verneint*, who combats ideal aspirations with a cynical sneer, that it might well be called a Zoroastrian drama. It is a picture of the conflict between the two opposite principles of good and evil, of affirmation and negation, of the beautiful and the ugly, personified in Faust and Mephistopheles, and it is painted on a background of the great mysterious unknown. 'Wer darf ihn nennen?'

> Who dares to name Him,
> Who to say of Him, 'I believe'?

Who is there ever with a heart to dare
To utter, 'I believe Him not'?

n poetry, Tennyson, the poet of modern thought,
the deepest chords when he asks—

Are God and Nature, then, at strife?

ıts in the sharpest contrast on the background of
nown, the conflict between the faith that

God is love indeed,
And love creation's final law,

harsh realities of nature, which

Red in tooth and claw
With ravine shrieks against the creed;

n in his later work, 'The Ancient Sage,' he

Thou canst not prove the Nameless, O my son!
For nothing worthy proving can be proven,
Nor yet disproven.

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sympathy in him which, as the poles of carbon attract so many elements and form so many combinations, enable him to take into his own nature, assimilate, and reproduce every varied shade of character from a Miranda to a Caliban, from an Imogen to a Lady Macbeth, from a Falstaff to an Othello. Sir Walter Scott and all our great novelists have the same faculty, though in a less degree, and are great in exact proportion as they have many poles in their nature, and as those are poles of powerful polarity. The characters and incidents which affect us strongly and dwell in the memory are those in which the clash and conflict of opposites are most vividly represented. We feel infinite pity for a Maggie Tulliver dashing her young life, like a prisoned wild bird, against the bars of trivial and prosaic environment which hem her in ; or for a Colonel Newcome opposing the patience of a gentle nature to the buffets of such a fate as meets us in the everyday world of modern life, the failure of his bank and the naggings of the Old Campaigner. On a higher level of art we sympathise with a Lancelot and a Guinevere because they are types of what we may meet in many a London drawing-room, noble natures drawn by some fatal fairy fascination into ignoble acts, but still retaining something of their original nobility, and while

Their honour rooted in dishonour stands,

appearing to ordinary mortals little less than 'archangels ruined.' Or even if we descend to the lowest level of the penny dreadful or suburban drama, we find that the polarity between vice and virtue, however coarsely delineated, is that which mostly fascinates the uncultured mind.

affinity between Zoroastrianism and art is
xplained when we consider that in one respect
manifest advantage over most Christian forms
on. Christianity in its early origins received a
Oriental asceticism which it never shook off,
ich in the declining centuries of the Roman
and in the barbarism and superstition of the
Ages, developed into what may be almost called
worship of the ugly and repulsive. The anti-
between the flesh and the spirit was carried
an extreme and false extent, that everything
s pleasant and beautiful came to be regarded as
nd the odour of sanctity was an odour which
ser-by would do well to keep on the windward
This leaven of asceticism is the rock upon
Puritanism, monasticism, and many of the high-
ns of Christian life have invariably split. It
ary to human nature, and directly opposed to

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tion of Rome; but the pendulum in its reaction swung much too far, and when organised in the celibacy of the clergy and monastic institutions asceticism became the source of great evils. Even at a late period we can see in the reaction of the reign of Charles II. how antagonistic the puritanical creed, even of men like Cromwell and Milton, proved to the healthy natural instinct of the great mass of the English nation. And at the present day it remains one of the main causes of the indifference or hostility to religion which is so widely spreading among the mass of the population. Children are brought up to consider Sunday as a day of penance, and church-going as a disagreeable necessity; while grown-up men, especially those of the working classes, resent being told that a walk in the country, a cricket-match, or a visit to a library or museum on their only holiday, is sinful.

In view of the approximation between the Zoroastrian religion and the forms of modern thought it is interesting to note how the former works among its adherents in actual practice. For, after all, the practical side of a religion is more important than its speculative or philosophical theories. Thus, for instance, the Quakers have a faith which is about the most reasonable of any of the numerous sects of Christianity and nearest to the spirit of its Founder, and yet Quakerism remains a narrow sect which is far from being victorious in the 'struggle for life.' Mahometanism, again, while dying out among civilised nations, shows itself superior to Christianity in the work of raising the barbarous, fetish-worshipping negroes of Africa to a higher level. And Mormonism, based on the most obvious imposture and absurdity, is the only

igion which, in recent times, has taken root and tain extent flourished.

d by this test, Zoroastrianism has made good its be called the 'excellent religion.' Its followers, ted community of Parsees in India, are honour- tinguished for probity, intelligence, enterprise, spirit, benevolence, tolerance, and other good s. By virtue of these qualities they have raised ves to a prominent position in our Indian empire, e a leading part in its commerce and indus- terprise. The chief shipbuilder at Bombay, the eat native railway contractor, the founder of actories, are all Parsees, and they are found as nts, traders, and shopkeepers in all the chief f British India, and distant places such as Aden nzibar. Their commercial probity is proverbial, in England, they have few written agreements,

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gh ideals above the sordid level of animal appetite ıd the selfish supremacy of brute force.

The Parsees in this respect stand high, far higher .an any other Oriental people, and on a level with the ›st European civilisation. The equality of the sexes distinctly laid down in the Zoroastrian scriptures. 'omen are always mentioned as a necessary part of ıe religious community. They have the same religious tes as the men. The spirits of deceased women are voked as well as those of men. Long contact with ıe other races of India, and the necessity for some ıtward conformity to the practices of Hindoo and ahometan rulers, did something to impair the posi- ɔn of females as regards public appearances, though .e Parsee wife and mother always remained a principal gure in the Parsee household ; and latterly, under the curity of English rule, Parsee ladies may be seen every- here in public, enjoying just as much liberty as the dies of Europe or America. Nor are they at all ›hind their Western sisters in education, accomplish- ents, and, it may be added, in daintiness of fashionable ,tire. In fact, an eager desire for education has become prominent feature among all classes of the Parsee com- unity, and they are quite on a par with the Scotch, erman, and other European races in their efforts to esta- ish schools, and in the numbers who attend, and especi- ly of those who obtain distinguished places in the higher hools and colleges, such as the Elphinstone Institute ıd the Bombay University. Female education is also tively promoted, and no prejudices stand in the way 'attendance at the numerous girls' schools which have ›en established, or even of studying in medical colleges, here Parsee women attend lectures on all branches of

science along with male students. Those who
ie position of inferiority and seclusion in which
are kept among all other Oriental nations can
oreciate the largeness and liberality of spirit of a
which, in spite of all surrounding influences,
dered such a thing possible in such a country as

other prominent trait of the Parsee character is
philanthropy and public spirit. In proportion
numbers and means they raise more money for
le objects than any other religious sect. And
se it in a way which does the greatest credit to
lerance and liberality. For instance, the Parsees
e principal subscribers to a fund raised in Bom-
aid of the 'Scottish Corporation,' and quite
a Parsee gentleman gave 16,000*l.* towards the
ment of a female hospital under the care of
tors, although the benefit of such an institution

them that it should be both a pleasure and a pride to associate their names with some act of noble liberality. A better spirit we may hope is springing up, and there have been occasional instances of large sums applied to public purposes, such as parks and colleges, by private individuals, principally of the trading and manufacturing classes, such as the Salts, Crossleys, Baxters, and Holloways; but on the whole the amount contributed is miserably small. It is probably part of the price we pay for aristocratic institutions that those who inherit or accumulate great fortunes consider it their primary object to perpetuate or to found great families. Be this as it may, a totally different spirit prevails among the Parsees of Bombay, where it has been truly stated that hardly a year passes without some wealthy Parsee coming forward to perform a work of public generosity. The instance of Sir Jamsedjee Jijibhoy, who attained a European reputation for his noble benevolence, is only one conspicuous instance out of a thousand of this 'public spirit' which has become almost an instinctive element in Parsee society.

How far the large and liberal religion may be the cause of the large and liberal practice, it is impossible to say. Other influences have doubtless been at work. The Parsees are a commercial people, and commerce is always more liberal with its money than land. They are the descendants of a persecuted race, and as a rule it is better to be persecuted than to persecute. Still, after making all allowances, it remains that the tree cannot be bad which bears such fruits; the religion must be a good one which produces good men and women and good deeds.

Statistical facts testify quite as strongly to the high

d of the Parsee race, and the practical results
follow from the observance of the Zoroastrian
A small death-rate and a large proportion of
n prove the vigorous vitality of a race. The
have the lowest death-rate of any of the many
who inhabit Bombay. The average for the two
1881 and 1882 per thousand was for Hindoos
for Mussulmans 30·46; for Europeans 20·18; for
19·26. The percentage of children under two
ld to women between fifteen and forty-five was
for Parsees, as against Hindoos 22·24, and
mans 24·9, showing incontestably greater vitality
ater care for human life.

5,618 male and 2,966 female mendicants in the
Bombay, only five male and one female were
.

se figures speak for themselves. It is evident

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CHAPTER XIV.

FORMS OF WORSHIP.

yron's lines—Carnegie's description—Parsee nature-worship—English Sunday—The sermon—Appeals to reason misplaced—Music better than words—The Mass—Zoroastrianism brings religion into daily life —Sanitation—Zoroastrian prayer—Religion of the future—Sermons in stones and good in everything.

> Not vainly did the early Persian make
> His altar the high places and the peak
> Of earth-o'ergazing mountains, and thus take
> A fit and unwall'd temple, where to seek
> The spirit, in whose honour shrines are weak,
> Uprear'd of human hands. Come, and compare
> Columns and idol-dwellings, Goth or Greek,
> With nature's realms of worship, earth and air,
> Nor fix on fond abodes to circumscribe thy prayer!
>
> *Childe Harold*, iii. 91.

A SHREWD Scotch-American ironmaster—Andrew Car-negie—in an interesting and instructive record of ex-periences during a voyage round the world, gives the ollowing description of the worship of the modern arsees, as actually witnessed by him at Bombay :—

'This evening we were surprised to see, as we trolled along the beach, more Parsees than ever before, nd more Parsee ladies richly dressed, all wending their ay towards the sea. It was the first of the new moon, period sacred to these worshippers of the elements; nd here on the shore of the ocean, as the sun was sink-g in the sea, and the slender silver thread of the

nt moon was faintly shining on the horizon, they egated to perform their religious rites.

'ire was there in its grandest form, the setting nd water in the vast expanse of the Indian Ocean etched before them. The earth was under their nd wafted across the sea the air came laden with rfumes of "Araby the blest." Surely no time or could be more fitly chosen than this for lifting up ul to the realms beyond sense. I could not but ipate with these worshippers in what was so ly beautiful. There was no music save the solemn of the waves as they broke into foam on the But where shall we find so mighty an organ, grand an anthem?

Iow inexpressibly sublime the scene appeared to nd how insignificant and unworthy of the un- a seemed even our cathedrals "made with human

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pletely out of harmony with its existing environment than our traditional form of church service. The sermon has been killed by the press and has become an anachronism. There was a time when sermons like those of Latimer and John Knox were living realities; they dealt with all the burning political and personal questions of the day, and to a great extent did the work now done by platform speeches and leading articles. If there are national dangers to be denounced, national shortcomings to be pointed out, iniquity in high places to be rebuked, we look to our daily newspaper, and not to our weekly sermon. The sermon has in a great majority of cases become a sort of schoolboy theme, in which traditional assumptions and conventional phrases are ground out, with as little soul or idea behind them as in the Thibetan praying-mill. In the course of a long life I have gained innumerable ideas and experienced innumerable influences, from contact with the world, with fellow-men, and with books; but although I have heard a good many sermons, I cannot honestly say that I ever got an idea or an influence from one of them which made me wiser or better, or different in any respect from what I should have been if I had slept through them. And this from no fault of the preachers. I have heard many who gave me the impression that they were good men, and a few who impressed me as being able and liberal-minded men—nor do I know that, under the conditions in which they are placed, I could have done any better myself. But they were dancing in fetters, and so tied down by conventionalities that it was simply impossible for them to depart from the paths of a decorous routine.

The fact is that the whole point of view of our

s services, especially in Protestant countries,
ome a mistaken one. It is far too much an
o the intellect and to abstract dogmas, and too
ie to the realities of actual life and to the vague
s and aspirations which constitute the proper
religion. In the great reaction of the Refor-
it was perhaps inevitable that an appeal should
e to reason against the abuses of an infallible
; and as long as the literal inspiration of the
id other theological premises were held to be
ed axioms by the whole Christian world, there
e a certain interest in hearing them repeated
d over again in becoming language, and in
to sermons which explained shortly con-
which might be drawn from these admitted
But this is no longer the case. It is impos-
touch the merest fringe of the questions now

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Duns Scotus, how many angels can stand on the point of a needle, and I remain unaffected; but let me hear Rossini's 'Cujus Animam,' or Mozart's 'Agnus Dei,' and I say, 'Thus the angels sing.'

In this respect the Roman Catholic Church has retained a great advantage over reformed churches. Whatever we may think of its tenets and principles, its forms of worship are more impressive and more attractive. The Mass, apart from all dogma and miracle, is a mysterious and beautiful religious drama, in which appropriate symbolism, vocal and instrumental music, all the highest efforts of human art, are united to produce feelings of joy and of devoutness. The vestment of the priest, his gestures and genuflexions, the Latin words chanted in stately recitative, the flame of the candles pointing heavenwards, the burning incense slowly soaring upwards, the music of great masters, not like our dreary and monotonous psalmody, but in fullest harmony and richest melody—all combine to attune the mind to that state of feeling which is the soul of religion.

In this respect, however, what I have called the Zoroastrian theory of religion affords great advantages. It connects religion directly with all that is good and beautiful, not only in the higher realms of speculation and of emotion, but in the ordinary affairs of daily life. To feel the truth of what is true, the beauty of what is beautiful, is of itself a silent prayer or act of worship to the Spirit of Light; to make an honest, earnest, effort to attain this feeling, is an offering or act of homage. Cleanliness of mind and body, order and propriety in conduct, civility in intercourse, and all the homely virtues of everyday life, thus acquire a higher

nce, and any wilful and persistent disregard becomes an act of mutiny against the Power ve have elected to serve. Such moral perversion impossible as that which in the Middle Ages ed filth with holiness, and adduced as a title to ation that the saint had worn the same woollen ntil it fell to pieces under the attacks of vermin. gh at this in more enlightened days, but we nitate it by setting up false religious standards, nking we can make men better by penning them undays in the foul air and corrupting influences ly peopled cities.

identification of moral and physical evil, which of the most essential and peculiar tenets of the rian creed, is fast becoming a leading idea in civilisation. Our most earnest philanthropists lous workers in the fields of sin and misery in cities are coming more and more every day

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ons for the healthy; and to providing clubs and ɜading-rooms as substitutes for the gin-palace and ublic-house. The latest development of this idea, that f the 'People's Palace' in the East End of London, is noble offering to the 'Spirit of Light,' by whatever ame we choose to call him, in opposition to the 'Spirit f Darkness.'

To the Zoroastrian, prayer assumes the form of a ecognition of all that is pure, sublime, and beautiful in he surrounding universe. He can never want oppor-unities of paying homage to the Good Spirit and of ɔoking into the abysses of the unknown with reverence nd wonder. The light of setting suns, the dome of ɔving blue, the clouds in the might of the tempest or esting still as brooding doves, the mountains, the

> Waste
> And solitary places where we taste
> The pleasure of believing what we see,
> Is boundless, as we wish our souls to be;

ıe ocean lashed by storm, or where it

> All down the sand
> Lies breathing in its sleep,
> Heard by the land—

ıese are a Zoroastrian's prayers.

And even if, 'in populous cities pent,' he is cut off ɾom close communion with nature, opportunities are ot wanting to him of letting his soul soar aloft with urifying aspirations. A glimpse of the starry sky, ven if seen from a London street, may bear in on him ıe awful yet lovely mystery of the Infinite. Good ooks, good music, true works of art, may all strengthen is love of the good and beautiful. A dense fog, or

g rain may obscure the outward view, but with
er eye he may stand listening to the lark or
e vernal sky, and while his

> Heart looks down and up,
> Serene, secure;
> Warm as the crocus-cup,
> As snowdrops pure,

he Good Spirit that it has been given to man to
d to him to read, verses of such exquisite perfec-
Shelley's 'Ode to a Skylark' and Tennyson's
Spring.' Above all, where men congregate in
in the great centres of politics, of commerce, of
e, science, and art, he can hear best

> The still sad music of humanity,
> Not harsh nor grating, but of ample power
> To chasten and subdue,

ciate himself with movements in which his little

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CHAPTER XV.

PRACTICAL POLARITIES.

Fable of the shield—Progress and conservatism—English and French colonisation—Law-abidingness—Irish land question—True conservative legislation—Ultra-conservatism—Law and education—Patriotism—Jingoism and parochialism—True statesmanship—Free trade and protection—Capital and labour—Egoism and altruism—Socialism and *laissez faire*—Contracts—Rights and duties of landlords—George's theory—State interference—Railways—Post Office—Telegraphs—National defence—Concluding remarks.

A WELL-KNOWN fable tells how in the olden time two knights were riding in opposite directions along a green road overarched by the trees of an ancient forest. It was a bright morning in early summer, with the green leaves freshly bursting in contrasted foliage ; the sun had just risen over the tops of the trees in clouds of golden and crimson glory ; dewdrops were glittering like diamonds on every twig and blade of grass ; and the joyous birds carolling their loudest song to greet the opening day.

Everything was fresh and cheerful as of a newborn earth, and so were the spirits of the two youthful knights, who were pricking forth in search of adventures. He whose face was turned towards the West, where the rising sun had last set, wore a primrose scarf over his cuirass, and had on his shield a quaint device, which,

r inspection, might be seen to be a tombstone
 inscription,

'I was well, would be better, and here I am.'

 along musing on the heroic legends of the past,
hing that he had been a knight of Arthur's round
 ride out with the blameless king against invad-
then.

 second knight, whose face was turned towards the
un, bore an azure shield with a different device.
was depicted the good Sir James Douglass
g the serried Paynim army, and, as he charged,
 before him into the hostile ranks the casket
ng the heart of Robert Bruce, and shouting for
ry—

Go thou aye forward, as was thy wont.

 rode his fancy wrought the fairy web of a

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'Your eyes must be of the dullest,' said the first ıight, 'if you mistake gold for silver.'

'Not so dull as yours,' retorted the other, 'if you .istake silver for gold.'

The argument waxed hot, and, as usual in such ıses, as tempers grew weak adjectives grew strong. oon, like the old Homeric heroes when Greek met 'rojan

Far on the ringing plains of windy Troy,

'inged words of fire and fury darted from each mouth, nd epithets were exchanged, of which 'stupid old 'ory' and 'low, vulgar Radical' were among the least nparliamentary. At length the fatal words 'You lie' scaped simultaneously from both, and on the instant pears were couched, steeds spurred, and, red with ıge, they encountered each other in full career. Such ;as the momentum that both men and horses rolled ver, even as the Templar went down before the spear f Ivanhoe within the lists of Ashby-de-la-Zouch. But, ke the redoubted knight Brian de Bois-Guilbert, each prang to his feet and drew his sword, eager to redeem he fortune of war in deadly combat. Like two surly oars with bristling backs and foaming tusks quarrelling ır the right of way in Indian jungle, or tawny lions in 'umidian desert tearing one another to pieces for the niles of a leonine Helen, the heroes clashed together, utting, slashing, parrying, foyning, and traversing, until t length, bleeding and breathless, they paused for a ıoment, leaning on their swords to recover second wind.

Just then an aged hermit appeared on the scene, rawn thither by the sound of the combat.

'Pause, my sons,' he said, 'and tell me what is the ıuse of this furious encounter'

nder false villain protests,' said the one, 'that
ld which hangs there is of gold.'

d that lying varlet persists that it is of silver,'
other.

hermit smiled, and said, 'Hold your hands, good
a single moment, and use your remaining
to exchange places and look at the opposite
the shield.'

y obeyed his words, and found to their con-
hat they had been fighting in a quarrel in which
s right and each wrong.

her,' they said, 'we are fools. Grant us thy
for our folly and absolution for our sin.'

solution,' said the hermit, 'is soon granted for
which arise from the innate tendency of poor
nature. Wiser and older men than you are
see only their own side of a question. Come,

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notion. As Herbert Spencer truly says, 'from antagonistic social tendencies there always results not a nedium state, but a rhythm between opposite states. Now the one greatly preponderates, and presently, by eaction, there comes a preponderance of the other.' So it is with the antagonism of conservative and liberal endencies. In the societies of the ancient world, and o the present day in the East, the conservative tendency nduly preponderates, and they crystallise into inert nasses in the form of despotisms, and of sacerdotal or dministrative hierarchies. At times the pent-up forces which make for change accumulate, and, as in the French Revolution, explode with destructive violence, hattering the old and bringing in new eras. But uness the balance between liberty and order is tolerably reserved in the individual citizens whose aggregate orms the society, after a period more or less prolonged f violent oscillations they crystallise anew into fresh orms, in which another military dynasty, or it may be dministrative centralisation under the name of a reublic, again asserts the preponderance of the centripetal orce.

The happiest nations are those in which the inlividual character of individual citizens supplies the equisite balance. An ideal society is one in which very citizen is at the same time liberal and conservative ; aw-abiding, and yet with a strong instinct for liberty f thought and action, for progress and for individual ndependence. It is among the Teutonic races, especially vhen they are placed in favourable conditions as in new ountries, or in old countries where for ages

> Freedom has widened slowly down,
> From precedent to precedent,

s happy ideal is most nearly realised. Hence it these races are more and more coming to the d surviving in the struggle for existence.

contrast of English and French colonisation striking instance of this difference of races. ury and a half ago France stood as well as l in the race for colonial supremacy. She had of us in Canada, and her pioneers had explored at Lakes, the Mississippi, and a large part of tinent of North America west of the Rocky ins. To-day there are sixty millions of an -speaking population in that continent, while is scarcely spoken beyond the single province of Political events had doubtless something to this result; but it has been mainly owing to the ualities of the two races, for even the genius of n might have failed to establish our supremacy

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ıerce fall into the hands of English, Germans, and 'hinese, as in Cochin China, or to stagnate as in New 'aledonia. As a witty French writer puts it, the trade f a remote French colony may be summed up as— nports, absinthe and cigars; exports, stamped paper ıd red-tape. Individualism in this case has been fairly itted against Socialism, and has beaten it out of the eld by the verdict of Fact, which is more conclusive ıan any amount of abstract argument.

To return, however, to the field of politics. Where ıe essential quality of being law-abiding is wanting individuals, it is hopeless to look for real liberty. he centripetal force in societies, as in planets, must be ıpplied somehow, or they would fly into dissolution; ıd if not by the integration of the tendencies of the dividual units, then by external restrictions. Socialts may be allowed to make inflammatory harangues a non-explosive atmosphere, but hardly to let off ıeir fireworks in a powder-magazine. In order, how'er, that a nation shall be law-abiding, it is essential at the great majority should feel that, on the whole, the w is their friend. It is not in human nature to love at which injures, or to respect that which is felt to be ıjust. The volcanic explosion of the French Revoluon was due to the feeling of the French nation, with e exception of a few courtiers, nobles, and priests, at the existing order of things was their enemy, and w a tool in the hands of their oppressors. Even ıong English-speaking races we find, in the unfornate instance of Ireland, that under specially unvourable circumstances the same effects may be 'oduced by the same causes. What has English law actically meant for centuries to an average peasant of

r Connemara? It has meant an irresistible
ent power, which comes down on him with
eviction to compel him to pay a high rent on
improvements. More than half the population
d consists of tenants and their families occupy-
ll holdings, paying less than 10*l*. a year of rent.
nmense majority of these small holdings two
nay be safely asserted: first, that the total gross
the produce is insufficient, after paying the
leave a decent subsistence for the cultivator.
y, that this rent is levied to a great extent on
rovements of the tenant or his predecessors.
hout the poorer parts of Ireland the greater
the soil, in its natural state of bog or mountain,
vorth a rent of a shilling an acre; but some
sant, urged by the earth-hunger which results
absence of other sources of employment, squats

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follow when the instincts of a whole population are brought by an unfavourable combination of circumstances into necessary and natural antagonism with the laws which they are bound to obey.

Conservative legislation, by whatever party it is introduced, really means making the law correspond with the common sense and common morality of all except the criminal and crotchety classes, so that the majority may feel it to be their friend. For instance, the most truly conservative measure of recent times was probably that which legalised trades' unions and gave working-men full liberty to combine for an increase of wages. The old legal maxim, that such combinations were illegal as being in restraint of trade, was so obviously an invention of the members of the upper caste who wore horsehair wigs, to give their fellows of the same caste who employed labour an unfair advantage, that it could not fail to cause feelings of discontent and exasperation among the masses of working-men. By its repeal the sting has been taken out of Socialism, and the British working-man has come to be, in the main, a reasonable citizen, on whom incitements to violence in order to inaugurate Utopias, fall as lightly as the howlings of the barren east wind on the chimney-tops. It has led also to reasonable and peaceful adjustment of disputes between employers and labourers by arbitration and sliding-scales instead of by strikes and lock-outs. In the United States of America the law-abiding instinct is even stronger. We find that strikes attended with violence are almost always confined mainly to the foreign element of recently imported immigrants, and that the native-born American citizen

s the laws as his own laws, and is determined them respected.

balance between the conservative and progres-dencies is, however, at the best, always im- and inclines too much sometimes in one ıetimes in the other direction. In England servative tendency has had on the whole too reponderance. I do not speak of political in-ıs, for in these of late years the balance has tty equally preserved; but in practical matters still a good deal of old-fashioned stolid ob-ı. This is most apparent in law and in educa-he common or judge-made law, though on the vell-intentioned and upright, is fettered by so chnicalities and musty precedents, that it fails ıt many instances to be, what civil law ought cheap, speedy, and intelligible instrument for r honest dealings between man and man. One

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be, and often is, not an instrument of justice, but a weapon in the hands of an unscrupulous adventurer or of a dishonest rich man, to extort blackmail or to defeat just claims.

Again, what nation but England would tolerate sc long a system of land law, so bristling with antiquated technicalities, so tedious, and so expensive, as almost to amount to a prohibition of the transfer of land in small quantities; or could let the private interests of a mere handful of professional lawyers stand in the way of a codification of laws and a registration of titles?

Education is another subject which shows how difficult it is to move the sluggish ultra-conservative instincts of the English mind in the direction of progress, when not stimulated by political conflict. What is education? The word tells its own story; it is to *draw out*, not to *cram in*; to unfold the capacities of the growing mind, strengthen the reasoning faculty, create an interest in the surrounding universe; in a word, to excite a love of knowledge and impart the means of acquiring it. For the mass of the population, education is necessarily confined in a great measure to the latter object. The three R's—reading, writing, and arithmetic—are indispensable requisites, and the acquirement of these, with perhaps a few elements of history and geography, absorbs nearly all the time and opportunity that can be afforded for attendance at school. For any culture beyond this the great majority must depend on themselves in after life. But there are a large number of parents of the upper and middle classes who can and do keep their children at school for eight or ten years, and spend a large sum of money in giving them what is called a higher education. What is there to

r this time and money, even in the case of the schools, which ought to give the highest educa- On the credit side, a little Latin and less Greek, of cricket and athletics, good physical training, st of all, on the whole a manly, honourable, and anlike spirit. But on the debit side, absolute ce, except in the case of a few unusually clever bitious boys, of all that a cultivated man of the ith century ought to know. No French, no , and, what is worse, no English. The average neither write his own language legibly nor tically, and, if he goes straight from a public into a competitive examination, stands an ex- chance of being plucked for spelling. And, what of all, he not only knows nothing, but cares to othing; his reasoning faculty has never been culti- nd his interest in interesting things has never been

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weighed and measured, and that two of them by combining shall produce their exact weight of a substance so unlike them as water! Or if the exercise of a class were to look through a microscope at the leaf of a plant or wing of an insect, and try who could best draw what they had seen and write a description of it in a legible hand and in good English, how many faculties would this call into play compared with the dull routine of parsing a Latin sentence or writing a halting copy of Greek iambics! Even grammar, the one thing which is supposed to be taught thoroughly, is taught so unintelligently that it awakens no interest beyond that of a parrot learning by rote. From 'propria quæ maribus' the scholar passes to 'as in præsenti perfectum format in avi,' without an attempt to explain what language really means, how it originates from root-words, and how these inflections of 'as' and 'avi' are part of the devices which certain families of mankind, including our own, have invented as a mechanism for attaching shades of meaning, such as present and past, to the primitive root. Even the alphabet intelligently taught opens up wide fields of interesting matter as to the history of ancient nations, and their successive attempts to analyse the component sounds of their spoken words, and to pass from primitive picture-writing to phonetic symbols. But the instructors of the budding manhood of the *élite* of the nation, like Gallio, 'care for none of these things,' and the organisation of our higher schools seems to be stereotyped on the principle that they are made for teachers rather than for scholars, and that their chief *raison d'être* is to enable a limited number of highly respectable gentlemen from the Universities to realise comfortable incomes with a maximum of holi-

or two among their acquaintan

Mr. Francis Galton, in the inquiries as to the effect of he character and attainments, took of addressing a set of questio eighty of our most distinguished qualities of their ancestors, and which they considered had don retard their success in life. (variety of answers, 'quot hom upon one point there was a stri almost all expressed a hatred of g and an utter distaste for the education. There were none w this old high and dry education it. Those who came from the did nothing there, and have abu

And yet the system goes o grammar will probably be ta written, for another generatio swings here too strongly towar structive pole.

[redacted]

gher and heroic virtues. Who does not sympathise ith the legends of Wallace and William Tell, and scorn ith Walter Scott

> Breathes there the man with soul so dead
> Who never to himself has said,
> This is my own, my native land?

nd yet how thin a line of partition separates it from arrow-minded arrogance and insolent ignorance! Reected in the latter form from Paris, in hysterical shouts ow of 'À Berlin, à Berlin!' and now 'À bas perfide lbion!' we call it 'Chauvinism,' and recognise it as an nlovely exhibition. But call it 'Jingoism,' and let it ake the form of the bellowings of some stupid bull, as he red flag, now of a French and now of a Russian care, crosses his line of vision, and we are blind to its eformity. Still there is another side to the shield, for ven 'Jingoism,' which is only another word for patriotsm run mad, is more respectable than the opposite xtreme of a sordid and narrow minded parochialism, which shrinks behind the 'silver streak,' measures everyhing by the standard of pounds, shillings, and pence, nd, with what Tennyson calls

> The craven fear of being great,

roans over the responsibilities of extended empire. The growth of such a spirit among prominent poliicians of the advanced Liberal school seems to me one f the most alarming symptoms of the day; but I take omfort when I reflect that the most democratic commuity in the world, that of the United States, is precisely he one which has shown most determination to mainain its national greatness, if necessary by the sword, nd has made the greatest sacrifices for that object. If

perheads' were a miserable minority in America, ould we be afraid of our 'English copperheads' oming a majority in Old England ?

his, as in all similar cases, it is evident that true anship consists in hitting the happy mean, and e right thing at the right time ; and that true stands firm in the middle between the two poles, while weakness is drawn by one or other onflicting attractions into

The falsehood of extremes.

n Sir Robert Peel some forty years ago an- his conversion by the unadorned eloquence ard Cobden, and free trade was inaugurated, sults which were attended with the most bril- ccess, every one expected that the conversion st of the civilised world was only a question of

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It is evident there must be some real cause for such a universal phenomenon. In countries like France and Russia we may attribute it to economical ignorance and the influence of cliques of manufacturers and selfish interests ; but the people of Germany, and still more of the United States, Canada, and Australia, are as intelligent as ourselves, and quite as shrewd in seeing where those interests really lie. They are fettered by no traditional prejudices, and their political instincts rather lie towards freedom and against the creation of anything like an aristocracy of wealthy manufacturers. And yet, after years of free discussion, they have become more and more hardened in their protectionist heresies.

What does this prove ? That there are two sides to the shield, and not, as we fancied in our English insularity, only one.

Free trade is undoubtedly the best, or rather the only possible, policy for a country like England, with thirty millions of inhabitants, producing food for less than half the number, and depending on foreign trade for the supplies necessary to keep the other half alive. It is the best policy also for a country which, owing to its mineral resources, its accessibility by sea to markets, its accumulated capital, and the inherited qualities, physical and moral, of its working population, has unrivalled advantages for cheap production. Nor can any dispassionate observer dispute that in England, which is such a country, free trade has worked well. It has not worked miracles, it has not introduced an industrial millennium, the poor are still with us, and it has not saved us from our share of commercial depressions. But, on the whole, national wealth has greatly increased, and, what is more important, national well-

ıs increased with it, the mass of the population, ecially the working classes, get better wages, ıorter hours, and are better fed, better clothed, er educated than they were forty years ago.

is one side of the shield, and it is really a nd not an illusory one. But look at the other ake the case of a country where totally opposite ns prevail: where there is no surplus popula- limited land, limited capital, labour scarce and d no possibility of competing in the foreign or the home market with the manufactures which, e trade, would be poured in by countries like l, in prior possession of all the elements of roduction. It is by no means so clear that on, to enable native industries to take root and ay not in such cases be the wisest policy.

as a simple illustration the case of an Austra-

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other hand, every workman who finds work, even if it may not be of the ideally best description, is a wealth-producing machine. What he spends on himself and his family gives employment to other workmen, and the work must be poor indeed if the produce of a year's labour is not more than the cost of a year's subsistence. The surplus adds to the national capital, and thus capital and population go on increasing in geometrical progression. The first problem, therefore, for a new or a backward country is to find 'a fair day's wages for a fair day's work,' for as many hands as possible. The problem of making that employment the most productive possible is a secondary one, which will solve itself in each case rather by actual practice than by abstract theory.

This much, however, is pretty clear, that in order to secure the maximum of employment it must be varied. All are not fit for agricultural work, and, even if they were, if the conditions of soil and climate favour large estates and sheep or cattle runs rather than small farms, a large amount of capital may provide work for only a small number of labourers. On social and moral grounds, also, apart from dry considerations of political economy, progress intelligence and a higher standard of life are more likely to be found with large cities, manufactures, and a variety of industrial occupations than with a dead level of a few millionaires and a few shepherds, or of a few landlords and a dense population of poor peasants. If protection is the price which must be paid to render such a larger life possible, it may be sound policy to pay it, and the result seems to show that neither it nor free trade is inconsistent with rapid progress, while, on the other hand, neither of them

an absolute immunity from the evils that dog the s of progress, and from the periods of reaction ression which accompany vicissitudes of trade. e, as in other cases, there are two sides of the and true statesmanship consists in seeing both, ng the right thing, at the right place, and at the me. If free trade is, as we believe, ultimately ail, it will be an affair of time. The real trial ection comes when it has stimulated production int which gluts the home market and leaves a which must be exported. Exports of articles t of which has been artificially raised by pro- cannot compete in the world's market with aper products of free-trade countries. Vicis- therefore of prosperity and depression must become more frequent and more severe, and, if ion goes on, a point must be reached where, at

instance of the inevitable error of applying hard and fast logical conclusions to the complex and ever-varying problems of actual life. Ricardo and other distinguished writers on political economy have assumed that the two constitute a fundamental antagonistic polarity. Wealth, they say, is the joint product of capital and labour, and, as in the case of a cake which has to be divided between C and L, the more C gets the less is left for L, and *vice versâ*. The theory sounds plausible : but what says fact? In the most unmistakable manner it pronounces, as the outcome of practical experience, that the profits of capital and the wages of labour rise and fall together. High profits mean high wages, rising profits rising wages, falling profits falling wages. It has been proved so in a thousand instances, and not one can be quoted where the one factor has varied in an inverse, and not in a direct, ratio with the other. It is obvious that there must be some fallacy in Ricardo's argument. The fallacy is this : he assumes the cake to be of fixed dimensions, whereas in point of fact it varies, sometimes diminishing to zero, or even to a negative quantity, at others expanding to many times its original size. A new gold-field is discovered in a remote country, and forthwith profits rise to cent. per cent., and wages to a pound a day ; a bad season and depression of trade overtake an old country, and the gross value of the produce of many a farm is insufficient to cover expenses and depreciation, even if the labourers worked for nothing. The polarity is therefore confined to the limited and temporary case of the division of the profit, where there is a profit, in particular trades and in individual instances. And this is regulated mainly by the accustomed scale of wages and standard of living of the work-

ıd their opportunities of finding employment
e if dissatisfied with the terms offered to them.
vhole, it may be said that capital has the best of
ising, and wages on a falling, market. A manu-
or mine-owner's profit may rise from five to
per cent. without quadrupling the rate of
but, on the other hand, it may fall from twenty
. to five, or even for a time below zero, without
tionate diminution in the price paid for labour.
is, in fact, the great insurer of labour, the fly-
vhich regulates the motion of the industrial
. This will be best illustrated by a practical
. The Brighton Railway Company for several
ive years paid no dividend, or only a trifling
on the shareholders' capital, but during the
f this time it gave steady employment at good
o upwards of ten thousand workmen. The

the nation. I am glad that it is so, for it is better, both morally and politically, that the condition of the masses should be improved, and their standard of living raised, than that capital should accumulate too exclusively in large masses.

Still there is a good deal to be said for such large accumulations. Let us go to the United States of America for an illustration, where everything is on a large scale, and colossal fortunes have been made in a few years. The *modus operandi* by which most of these fortunes have been made may be described according to the way we look at it, either as railway jobbing or as pioneering the way in useful enterprise. The construction of the first railway across the continent to California is a typical instance. A clique or syndicate of wealthy speculators make surveys and estimates of a line across deserts and over mountain ranges, and ascertain pretty accurately what it will cost. They form a company with a capital of double that cost, and by subventions from the Government, grants of land, and sale of mortgage bonds, raise the half really required, and hold the other half in shares as profit in paper. The line is made, and if the traffic turns out well, and there is a period of speculation in the money market, the paper is turned into dollars, and, if the line really costs, say, 10,000,000*l.* or 20,000,000*l.*, the promoters realise an equal amount as profit.

This has two sides to it: it is doubtless bad for the public to have to pay rates which give a return on twice the actual cost, and the possession of a close monopoly in the hands of a few millionaires may be abused to the detriment of individual traders. But, on the other hand, the railway could not have been made in any

ay. If it had been necessary to wait until the
owth of population insured such a traffic as
duce the ordinary public to subscribe for shares
ou might have waited for twenty years before a
ile of railway was made west of the Mississippi.
is all: the enormous profit realised in the first
enterprises led to a rush of rich speculators
lottery of pushing railways ahead of traffic, in
ere were such magnificent prizes. The con-
as covered by new railways built to create new
ather than to provide for that which already
And the traffic was created, though, as the
ontained blanks as well as prizes, many of the
promoters were ruined. The second great line
the continent—the Northern Pacific—ruined
essive sets of promoters, and is only now begin-
be moderately successful.

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individuals as free as possible to act on their own suggestions of their duties and interests, and confining the intervention of the State to enforcing laws for the protection of life and property, and such measures as are obviously necessary for the safety of society. According to the other theory, the State ought to interfere wherever the results of individual liberty lead to abuses, and should endeavour to create a society as near to ideal perfection as possible, by administering and regulating the public and private affairs of its citizens. It is obvious that the question has two sides, that extreme conclusions in either direction are, as is always the case, invariably false. Individualism carried too far would disintegrate society. It would be impossible to leave it to the short-sighted selfishness of every citizen to say whether an army and navy should be maintained for national defence, and taxes should be levied for their support.

Individualism also easily passes over into a hard and cruel selfishness, which recognises no obligation beyond the letter of the law, and acts practically on the principle of 'Every one for himself, and the devil take the hindmost.' It is this phase of individualism which makes enthusiasts and men of strong moral and religious sympathies declaim so vehemently against *laissez faire*, and cry aloud, like Carlyle, for a hero or benevolent despot who is to scourge humanity into the practice of all the virtues.

On the other hand, Socialism, if not confined within rigid limits of experience and common sense, is even more destructive in its consequences. Civilised society is based on the security of private property and the observance of contracts. If these are liable, not merely

regulated in extreme and exceptional cases, but
ıbsolutely condemned in principle, as by Socialists
Proudhon school, who declare, 'La propriété
e vol;' or overruled and set aside whenever they
ought to conflict with humanitarian scruples or
ıental aspirations, society would be dissolved into
ments, to crystallise anew about some military
or or other strong form of repressive government,
ould restore it to a state of stable equilibrium in
ance with these fundamental laws.

society based on the community of goods has
xisted, except on a very limited scale and for a
hort time, under some strong temporary influence
ıs religious excitement. In the early Christian
h it only existed as long as its members were a
ıl of humble individuals who were impressed with
ea that the end of the world was close at hand,

[redacted]

unities of Russia and parts of India, which certainly ow no signs of being progressive types destined to ain ground. On the contrary, they fail to fulfil what s the first condition of an agricultural community, that of obtaining a fair average produce from the soil, and the more enterprising and intelligent moujiks or ryots invariably seek to obtain something which they can call their own and are not obliged to share with the idle and improvident. A conclusive objection to all schemes of Socialism or Communism is, that they not only crush out all individual initiative and enterprise in material life, but that they also destroy all incentives to individual charity and benevolence. Why make sacrifices to help others, if they are already helped at your expense by the State? This is no theoretical objection, but has been proved practically by the history of the poor laws. What scope for individual charity was there in a parish like that in Buckinghamshire, where under the old poor law the rate had risen to twenty shillings in the pound, and the cultivation of the soil was abandoned? Or even in less extreme cases, any one who is acquainted with remote rural parishes inhabited by cotters and small farmers must be aware that the poor law operates strongly to destroy the feeling of manly independence and family affection which induced the poor to support their own aged and infirm relatives.

In many parts of Scotland with which I am personally acquainted men who a generation ago would have thought it a disgrace to ask for help to support an aged father or mother, now think it only fair play, after having contributed for years to the poor rate, to try and get something out of it in return.

uism, as Herbert Spencer well puts it, if carried s, defeats itself, for in annihilating egoistic vices ilates egoistic virtues, and the result is zero—a hich, as 'nature abhors a vacuum,' can happily e attained, and the precepts of the Sermon on unt must always remain maxims of private , rather than of State regulation.

of little use, however, to deal with such gene- as long as we confine ourselves to extreme s on either side, it is as easy as it is idle to hem. Profitable discussion only begins when r on the wide intermediate space which lies be- he extreme frontier provinces, and, instead of for absolute conclusions, endeavour to discover py mean in doubtful cases, where there really tations of time and circumstance, and a good ich may be reasonably said on each side of the

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contract must be a free one, freely entered into by parties who meet on equal terms. If it is a compulsory one, which the weaker party has practically no option of refusing, the case is altered. Thus, in the case of children, it is absurd to say that they are free agents in contracting for the disposal of their labour, and the State properly interferes by Factory Acts to limit the number of hours for which they are to work. So in the relations between landlord and tenant, whenever they meet on equal terms, and the tenant has an option of either taking or refusing to take a farm at the rent asked, both sides must be held to their bargain, however disadvantageous it may turn out for either of them. But if the landlord is practically omnipotent, and the tenant has no alternative but to promise to pay an impossible rent or to be turned out on the roadside and die of starvation, it is by no means so clear that the State should enforce the bargain unless the landlord submits to equitable terms. Or again, if the rent is not due to the intrinsic value of the land, but is a confiscation of the tenant's improvements, it is far from being self-evident that the law should look only at landlords' rights and forget all about landlords' duties.

It is a question rather of fact than of argument or assertion, whether such a state of things does or does not prevail at any particular time in any particular country. If the contracts were fair bargains entered into by free agents, they ought to be enforced whether prices have risen or fallen, leaving it to the humanity and self-interest of landlords to make reasonable reductions. But if they were no more equal bargains than those of slaves or factory-children, the State might

nterfere to attach equitable conditions to the
ment of inequitable contracts.
antithesis between the rights and duties of pro-
specially in the case of land, is one which raises
ice and difficult questions. Some theorists, like
George, are for solving it by ignoring the rights
ner. According to them, private property in
the source of all the evils that afflict modern
; poverty, depressions of trade, low profits, and
ges are caused by the constant drift towards high
lue to the possession by a small section of the
nity of a monopoly in that which is as much a
y of existence as air or water. Abolish private
y in land, and straightway you will have the
ium.
his extreme form the fallacy of the argument is
. You cannot stop at land, but must have the
of your opinion, and go the full length, with
on, of denouncing all property as robbery. For
ght of individual property is the first condition of
l society, you can hardly exclude that form of it

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confiscation of any other sort of property, when theorists, philanthropic at other people's expense, thought that the owner had more than was good for him, or had acquired it as an unearned increment, without working for it. Suppose two men, A and B, employed as engine-lrivers on an American railway, have each saved a ıundred dollars. The railway has been a failure: in-ended to reach a distant terminus, it has stopped half-vay in a desert, for want of funds, and for years has ›aid no dividend. The hundred-dollar shares are only vorth ten, and the land at the distant terminus is only vorth ten dollars an acre. But A and B are sharp ellows, and see that if speculation ever revives the line vill probably be completed, and both shares and land vill become valuable. A buys ten shares with his undred dollars, and B ten acres of land. The boom omes, the capital is found, the line completed, and the hares rise to par, and the land to a hundred dollars n acre. A and B have each realised nine hundred ollars by what may be described, as you like to put , either as an unearned increment or as providence nd foresight. On what principle can you confiscate 's nine hundred dollars because it is in land, and leave 's untouched because it is in shares?

On the other hand, there is no doubt that when we ›me to more complex cases, in which land is held in ırge masses, fenced in, not by the natural right of a ıan to the produce of his own exertions, but by arti-cial legal systems of inheritance and settlement, we are n neutral ground, where fair discussion is possible as › the limitations and conditions under which the State ıay afford its protection. Landed property is more ıe creature of law, and runs greater risks in case of

on or communistic legislation, than personal
, which is more easily concealed or transferred.
unreasonable, therefore, that it should pay a
nsurance in the form of taxation, and especially
passes by inheritance or settlement, when the
ner's title is to a great extent artificial and the
of the law. No one can dispute the abstract
f a succession duty on all property, landed or
, in proportion to its amount, passing by opera-
aw : the only question can be as to the amount,
expediency of confining it within limits that
t trench on confiscation or impair the desire to
ate capital. And in the case of land, there is
t that there are a good many instances in which
tion of the 'unearned increment' is raised more
than in the case of ordinary property. Take a
instance within my own knowledge, for an
ion is often better than an argument. There

[redacted]

to do what he liked with his own, and it probably never occurred to him that he was under any moral obligation to go beyond the law. But I do think that the law would have been more just, and better for the interests of the community, if it had made some portion of this unearned increment of 7,000*l.* a year liable for a contribution towards the sanitary and other objects essential for the decent existence of the town which had grown up on this property and given it this increased value. I cannot help thinking that centuries of landlord egislation, and of a public opinion based mainly on hat of the wealthy and specially of the landed classes, have made our laws in many respects too favourable to he predominant interests, and that the swing of the endulum now is, and properly is, in the direction of ecognising the duties as well as the rights of property.

We must take care, however, not to let it swing too ar in this direction, for of the two evils it is better to ut up with occasional cases of hardship and oppression n the part of bad landlords than to endanger the seurity of property by reforms pushed to extremes at the ictation of impulsive masses, designing demagogues, r sentimental philanthropists.

Herbert Spencer, in his works on Sociology, often wells with great force on the evils which arise from tate interference. There can be no doubt that it is ery undesirable that the State should become a sort of ack-of-all-trades, and undertake branches of business hich can be conducted by private enterprise. It is ndesirable for two reasons: first, because the work is ertain to cost more and be worse done; secondly, for he still more important reason that it tends to extinuish individual enterprise, strangle progress with red-

s 2

teach a nation to look, like children to outside , rather than, like men to their own. Still the has two sides. Whatever individual enterprise hould be left to it; but there are, in the com- ditions of modern society, a number of things nnot be done by individuals, and which must left undone or done by the State, or by some hority, joint-stock company, or other quasi- y sanctioned by the State. Thus, if it were a of bringing coals from Newcastle by sea, no d suggest that the State should interfere with te enterprise of individual shipowners. But them by land requires railways, and railways be built by capitals beyond the reach of private ls. If the State had not delegated a portion of rs to joint-stock companies, not a ton of coal er have been brought by land to London.

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ment preponderate, but there are drawbacks which make it doubtful. Even at a sixpenny rate a great deal of the telegraphic communication of the large towns and active centres of business is taxed to make up for the deficiency of the rest of the kingdom. And invention and improvement in telegraphy are no doubt checked to a considerable extent by creating a State monopoly whose first duty it is to try to satisfy its masters at the Treasury by making the system pay.

When we come to railways we are on debateable ground, and it is fairly arguable that they should be worked by the State for the public good. But the objections here outweigh the advantages. Every one who has any practical experience of the working of railways must be aware that the simplicity and uniformity of the penny postal system are totally inapplicable, and that the traffic of the country requires, above all things, great freedom and elasticity in meeting, day by day, the varying contingencies which arise. Here is an illustration : In a certain town in France, on a railway worked by the State, it was determined to have a *fête* in order to raise funds for a hospital, and, as an attraction, to bring down from Paris a small troop of actors and have a play in the evening. The question turned on the railway consenting to give them a reduced fare for the return journey. The manager of the railway was quite willing, but said that he had no power to alter the tariff without permission from the Minister of Public Works. The permission was applied for, and the result was that it arrived exactly on the day twelve months after the *fête* had been held.

Contrast this with the case of the general manager of the London and North Western Railway sitting in

at Euston and receiving half a dozen telegrams
m to quote special rates, one perhaps for beef
icago to London, another for emigrants from
; to New York *via* Liverpool, and all requiring
ic answers then and there, if the business is to
t all.

n, if railways had been in the hands of the
lo not suppose that we should have had half
nt mileage; for the Treasury would never have
d the outlay of public money on lines which
show the prospect of a fair return on the
nd it would have vetoed any multiplication of
reduction of rates which threatened loss to
equer. I can speak with some authority on
t, for I have been both Chairman of a railway
and Secretary of the Treasury, and I am cer-
in the former capacity, I have introduced im-

[redacted]

that the duty is not evaded. Wherever neglect involves danger to others, as in the case of small-pox and other contagious epidemics, it is clear that the decision cannot be left to individuals, and the State is bound to interfere to enforce rational precautions.

So also the State is bound to undertake trades which are essential for the protection of the nation against foreign enemies. Our dockyards and arsenals may, and doubtless do, often make mistakes and turn out expensive work; but we could not safely leave the building of ironclads and supply of cannon solely to private enterprise, for there is no such large and steady demand for such articles as would induce a number of private firms to erect works and keep up establishments adequate to supply the wants which might arise in an emergency. In all such matters, therefore, of national defence we must put up with a certain amount of drawbacks incidental to State management, and confine ourselves to endeavouring to reduce them to a minimum. And this is to a great extent within the power of the nation and its Parliament, by applying common-sense principles of business to national expenditure, and seeing that while on the one hand we get as nearly as possible a pound's worth of work for every pound spent, on the other hand we do not spend nineteen shillings uselessly, because some Chancellor of the Exchequer wants to gain momentary popularity by the 'penny wise and pound foolish' economy of docking the extra shilling off the necessary estimates. In private life a man gets on by knowing when to spend as well as when not to spend, and true economy has no greater foe than spasmodic parsimony alternating almost certainly with spasmodic extravagance. It would be

multiply instances, for there are few phases
al and practical life to which the principle of
loes not apply, where extremes are not false,
re there is not a good deal to be said on both
he question. But the very obviousness of the
makes it difficult to deal with it generally
degenerating into commonplace, while to trace
ation exhaustively in any one instance would
volume. Those who wish to pursue the
urther will do well to study the works of
Spencer, where they will find the application
l principles to all the problems of sociology
with a depth of philosophic insight and an
e and aptness of illustration which I cannot
o equal. My ambition is of a humbler nature.
expect to set the Thames on fire, or to produce
ion in modern thought; but I do hope that the

the wise sayings of the ancient sage; the sum of
: reflections which I have tried to embody in the
eceding pages would take form and crystallise in the
llowing sonnet :—

Hail! gracious Ormuzd, author of all good,
Spirit of beauty, purity, and light;
Teach me like thee to hate dark deeds of night,
And battle ever with the hellish brood
Of Ahriman, dread prince of evil mood—
Father of lies, uncleanness, envious spite,
Thefts, murders, sensual sins that shun the light,
Unreason, ugliness, and fancies lewd—
Grant me, bright Ormuzd, in thy ranks to stand,
A valiant soldier faithful to the end;
So when I leave this life's familiar strand,
Bound for the great Unknown, shall I commend
My soul, if soul survive, into thy hand—
Fearless of fate if thou thine aid will lend.

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ran public man, who has during forty years past, after h mathematical honours at Cambridge, been constantly Board of Trade official administration, or in the duties of a Parliament, or as Finance Minister of India, or as Chairman hton Railway Co., is not likely to be a dreamy idealist, or a bigot. He has a vast acquired fund of practical common- ned faculty of induction and experimental reasoning, the king all round the different sides of a question, and then central point, and that of reducing to just proportion and n.

ingly, Mr. Laing's summaries of the general propositions

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